LIBRARY OF CONGRESS
MAR 26 1893
SMITHSONIAN DEPOSIT

THE AMERICAN GAS LIGHT JOURNAL

REDMAN&KENNY,N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LVIII.—No. 13. Whole No. 929. | NEW YORK, MONDAY, MARCH 27, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order-registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C.O.D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 433
The Meeting of the Ohio Association—Notes.

*Fitzgerald's Gas Washing and Scrubbing Apparatus 434

*Kenevel's Process of Gas Manufacture 436

An Investigation of Coals for Making Coke in the Semet-Solvay Ovens, with the Recovery of Ammonia and Tar, etc., by Mr. J. D. Pennock. Concluded from page 402 438

Thermal Storage for Central Stations, by Mr. George Forbes 440

Special English Correspondence 441
The London Gas Testing Arrangements—The State of the Gas Industry—An Accidental Explosion.

Relation of Insurance to Electric Lighting and Power, by Mr. William Brophy 442

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 443
A Correction—Cheaper Gas for Portland, Oregon—A Few Extracts from a Letter—Mr. Cardell Takes Charge at Huntsville, Ala.—Contracts for the Hazelton Boiler Company—Main Improvements, Houston, Texas—Cheaper Gas for Lawrence, Mass.—Annual Meeting, Colusa, Cal.—Changes at Santa Cruz, Cal.—The Rockville (Conn.) Company Ready to Supply Incandescent Electric Lights—Consolidation at Ottawa, Can.—A Suit for Damages—Annual Meeting, Westminster, Md.—What the Balto. *Sun* Thinks of the Chicago Plan—Cheaper Gas for East Boston, Mass.—Death of Dr. F. R. Humphreys—Some Aldermanic "Resolves," Boston, Mass.—That Talked of Opposition at Montreal—The Menominee (Mich.) Gas Plant—Plumbing Regulations, Washington, D. C.—And Other Items.

The Market for Gas Securities 446

BRIEFLY TOLD.

THE MEETING OF THE OHIO ASSOCIATION.—The telegraphic correspondence concerning the 9th annual meeting of the Ohio Gas Light Association, that was forwarded by "Three Stars" for publication in our issue of last week, covered pretty well that which was done at the convention; but a word or two more of comment may not at this time be amiss. It was a regrettable fact that the weather conditions were not a trifle more conducive to personal comfort, but the excellent attendance and the persistence that those who journeyed to Columbus devoted to the sessions goes to show that the Association is alive keenly to the benefits that come from mutual confidence and fraternal counselling. It is our pleasant duty to chronicle the fact that the meeting was most judiciously directed by President Welch, and it goes without saying that the Secretary's duties were in capable hands, for Mr. Butterworth's capacity in this direction is an old story now. Mention of Mr. Butterworth recalls the fact that the Association did the very correct thing when it elevated him to the Presidency, and its choice of a Secretary (Mr. Lathrop) was also a happy one; for the new incumbent has on more than one occasion shown himself to be a man of well balanced methods. It is, of course, to be regretted that Mr. Tayler, of Warren, who, according to the well recognized rule of procedure followed in such matters by our Associations of Gas Engineers, was next in line for promotion to the Presidency, peremptorily declined election; but as his declination was positive there was nothing to do but accept his decision.

One of the prominent matters not alluded to by "Three Stars" in the telegraphic advices was the report of the committee appointed to cooperate with other Gas Associations in an effort to bring about uniformity in special castings for gas works, and that committee (Messrs. Butterworth, Faben and Printz) are to be congratulated upon the likable outlook for such uniformity of practice by the foundrymen of Ohio. In fact, the committee felt that they "were warranted in reporting that the various foundries throughout this part of the country are ready to adopt standard patterns as soon as gas companies are ready to use the castings made from them." If this is so, and the men who so reported are not of the stamp to put themselves thus on record without being pretty sure of the safety of their knowledge, we fail to see what stands between theory and practice now in the actual use of standard castings; for, certainly, the gas companies of Ohio "are ready to adopt" forthwith a system that cannot fail to save them time, money and vexation. In connection with their report the committee handed in a letter from a leading foundryman, who was appealed to by them for an expression of his views, and as that letter shows the spirit of the ironworkers towards the proposed system of standard castings, we think it worth while to reproduce it. The gentleman said: "We certainly are in accord with your efforts to get, if possible, a standard for the specials used for both water and gas purposes. While we are perfectly willing to make any changes to please our patrons, I doubt very much whether any plan could be adopted by your Association that would be indorsed by the different gas companies of this State. Though they may agree to use them, our experience is that each engineer has his own ideas as to the purposes he intends to use castings for, and consequently claims that he is amply able to judge of his wants, irrespective of any agreement,

which to my mind he has a perfect right to do. And, then again, all the foundries in the West deal as largely in gas supplies in each State other than Ohio, and these gas companies outside of Ohio should adopt the same standard. I had this matter up a day or so ago with a member of your Association hailing from the southern part of the State, and a remark that he made was that he thought he knew as much about his individual business as any Association did, and should order such castings as he wanted, and should expect to get them. No foundry should be safe in saying to a customer that he should not have such castings as he might order, but must confine himself entirely to the Association pattern. So, you see, it will necessitate a large expense upon the several foundries to comply absolutely with the request, unless all members of your Association will agree absolutely to take the castings in accordance with such styles and shapes as you may elect. I believe, however, that our patterns are very close to the contemplated ones, and would be near enough for all practical purposes. All foundries west of the Allegheny mountains have had this matter up for discussion for some time and we have ventilated it very thoroughly. We are having meetings from month to month, and are to hold one now within a day or two, when I will take the matter up, and we will discuss it from a manufacturer's standpoint, and, if possible, agree upon a united action with a view to complying with your wishes as far as possible; at least I shall so recommend it." The opinion or remark in the above well tempered letter to the effect that it would be necessary to have the gas companies of all the Western States take up the standard system, of course is incontrovertible; but the slightly implied doubt that such concerted action would not be comparatively easy of attainment does not seem to hold. The Western Gas Association could attend to that horn of the dilemma without any danger of impaling either the gas companies or the foundrymen; and that the Western would do so does not admit of a contrary. The warning note in the letter, which is sounded because of the belief of one gas man that he knew what suited his case best, proposing or suggesting the impossibility of united or concerted action, need only be taken for what it is worth; for what would one or two, or even three objectors amount to when the 70, 71 or 81 favored the proposal. Indeed, it seems to us the recalcitrant would not long remain in a position where they would be obliged possibly to pay more "for such castings he wanted, and should expect to get them." This is really a most important matter, and the Society of Gas Lighting, that originally proposed this sensible undertaking, ought to be entertaining a sentiment of satisfaction that the spirit evoked passes on to reality.

President Welch's message was a commonsense document, devoid of frills and filled with the threads of good substantial argument. His remarks anent the unbusiness-like policy of the gas proprietors who debar their Superintendents from sharing in the benefits of actual participation in these and kindred gatherings have often found counterpart in our columns. Nor are such criticisms other than just and well merited. His discourse on the competition of kerosene oil is a faithful picture of the situation, and his reference to that uncanny monster—the Tar Trust—which grows uncleaner as it ages, we hope will receive the study that the importance of the subject demands. In fact, Mr. Welch put together a most readable address, another luminous feature of which is his indisputable arraignment of the incandescent electric light, in its relation to-day towards good gas as a competitor. It is quite like the way that he puts it. "The consumer [of electric light] must now be educated to the task of using half the former amount of light, or of paying double the tax for a like quantity." There is the thing in a nutshell. We had hoped to in this number print the first installment of the report of the proceedings, but the copy came to hand at too late an hour. We were obliged to put over its publication for a week.

NOTES.—The barge "Knickerbocker" arrived at this port on Monday last, from Baltimore, with 4,014 tons of Ocean Mine gas coal, shipped by Messrs. Perkins & Co. for the Consolidated Gas Company, of New York. This is the largest cargo of gas coal, if not of any kind of coal, ever delivered in this port. The "Knickerbocker" is a new vessel, the trip noted having been her second. She is 260 feet long and 50 feet beam, with a capacity of about 4,500 tons. She was built at Bath, Me., and is owned by Messrs. Morse & Co. Compare this, for instance, as a carrier with the old timer (the "Cordelia,") which in her time (about 1845) was the largest tonned coal carrying vessel plying between Nova Scotia and Boston—and the "Cordelia" could, at a pinch, manage to transport 120 tons.——It is understood that the proprietors of the Consumers Gas Company, of Toronto, are about to order another cut in the selling rates. ——The plant of the Healdsburg (Cal.) Gas Company is to be enlarged to double its present capacity.

Fitzgerald's Gas Washing and Scrubbing Apparatus.

On March 7th U. S. Letters Patent (No. 493,156) were granted to Mr. John H. Fitzgerald, Superintendent of the Houston (Texas) Gas Light Company, for an improved washer scrubber. Using the words of the specification:

This invention relates to a "washer scrubber" adapted for washing and scrubbing gas to cleanse it of tarry matter, ammonia, sulphureted hydrogen, carbonic acid and other impurities.

The object of the invention is to provide for repeatedly dividing the gas into numerous fine streams, and subjecting such streams, first, to the washing liquor, and then to suitably wetted scrubbing surfaces in the nature of perforated or reticulated plates or screens, so as to effectively remove the contained impurities in a comparatively inexpensive apparatus, which may be operated without the use of power gearing.

Another object is to provide for distributing the washing liquor over the surface of the perforated plates or screens, which constitute the scrubbing surfaces, successively from one chamber or compartment of a column washer-scrubber to another, so that the gas in passing up through the column is subjected to a great number and extent of moist scrubbing surfaces.

In carrying out my invention, I provide the horizontal partition plates of the different sections or compartments of a column scrubber with numerous return bend pipes, having perforated or slotted distributing heads, which dip a short distance into the liquid, and serve for uniformly distributing the gas in fine streams throughout the whole area of each section or compartment; and also provide in each compartment a series of perforated plates or screens above the discharging pipes, so that the gas on issuing in fine streams through the purifying liquid passes thence in contact with the wet scrubbing surfaces of such screens, whereby it is most effectively cleansed from its various impurities. The transfer or overflow pipes for conducting liquid from one chamber or compartment to another, dip at their lower ends into cups which rise nearly to the top of the chamber, and are provided at their tops with wide flanges for distributing the overflow liquid over the top surfaces of the perforated plates or screens, thereby keeping them wetted.

I will now more particularly describe the construction and arrangement of my apparatus by reference to the accompanying drawings, in which Fig. 1 represents a side view of the washer scrubber, partly in elevation and partly in vertical section, showing the internal construction and arrangement of the compartments and their washing and scrubbing devices. Fig. 2 shows a horizontal section taken on different horizontal planes, showing the return-bend pipes on one side and the perforated plates on the other side. Fig. 3 represents, on an enlarged scale, a sectional detail view of return-bend pipes and their perforated heads and perforated plates above such pipes.

The gas washing and scrubbing column A is preferably composed of a number of superposed sections, as A^1, A^2, A^3, etc., to A^6, or any other desired number of sections, and the sections may be constructed of cast or wrought iron, or other metal, and are separated one from the other by horizontal partition plates B, which are made the full diameter of the flanges a of the sections, so as to be held in place by the bolts or rivets used in connecting the flanges together. The partition plates B are provided with numerous holes throughout their entire area, into which are screwed or otherwise secured the return-bend pipes b, which, as clearly shown, are formed with a long and a short portion, the long portion rising from the partition plate and the short portion extending down a short distance from the crown of the pipe. The short portion of the return-bend pipes is provided with a perforated or slotted head b', forming numerous perforations b'', at its under surface, and such perforated head dips a short distance into the body of liquid w, resting upon each partition plate B. The partition plates B, between the sections A^1, A^2, A^3, etc., divide the column into chambers or compartments, each of which is fitted with washing and scrubbing devices, as shown, and the top of the column is closed by a head a', and the bottom by a plate a''. Above the return-bend pipes b, in each chamber, are placed a series of perforated plates or screens C, which may be formed of metal or wood, or other suitable material, and which are separated one from another by distance strips or rings c, the bottom plate of the series resting upon the tops of the return bend pipes, as shown. The plates are preferably so arranged that a solid portion of an upper plate will be placed above the perforations of the adjacent lower plate throughout the series, in order to cause the gas to take a more tortuous or zigzag passage, and thus be brought in contact with a greater extent of scrubbing surface. The plates C are preferably made in strips or

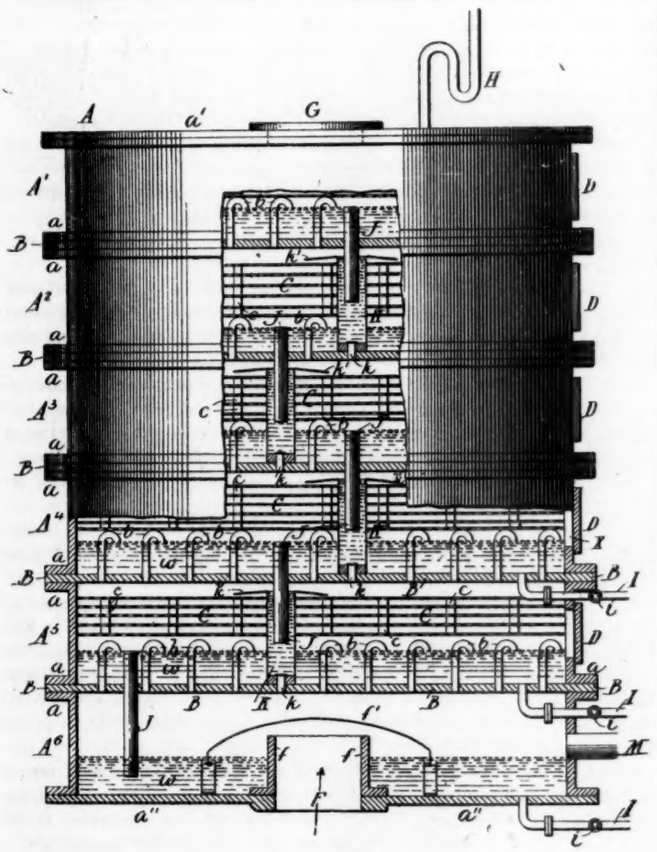


Fig. 1.

sections, which may be conveniently inserted through the manhole openings in X the wall of the column, or of each section thereof.

The water or other washing liquid is transferred from one chamber to another by means of the overflow pipes J and cups K. The seal cups K are secured at their bottoms to the plates B, by means of stud bolts k, and such cups rise nearly to the top of each chamber, where their upper ends are provided with a broad downwardly inclined flange k', which projects over the upper perforated plate C, as clearly shown in Fig. 1.

The transfer or overflow pipe J is inserted in a suitable opening in each partition plate, and rises in each chamber to the proper height for maintaining a body of liquid in each chamber at the proper height for slightly sealing the perforated heads b' of the return bend pipes, as shown in Fig. 3, and also extends down into the seal cup of the chamber below, so that gas cannot escape through it.

The gas inlet opening F of the bottom plate a'' is provided with a short upwardly extending pipe f, which is preferably covered by a floating hood or cap f', for better distributing the inflowing gas. The upper plate a' of the column is provided with the usual gas outlet G, and also with a water supply pipe H. A drain pipe I, having a valve i, preferably leads from each chamber through the partition plate B, for drawing off the concentrated ammoniacal liquid. Each section of the column A^1, A^2, etc., is provided with a manhole X, closed by a lid or door D. The lower section or chamber of the column is provided with an outlet pipe M, which, in practice, leads through a trap or seal to a well or cistern for receiving the liquor.

Although my washer scrubber is illustrated in a cylindrical form, I wish it understood that I do not confine myself to such shape, and it may be made square, or rectangular, or of any other desired form.

Before securing the sections together the inner surfaces of the flanges a, and also the surfaces of the partitions B, where it is to be secured between the flanges, are planed, so that perfectly tight joints may be made when the parts are properly riveted or bolted together. The short flange pipe f, rising from the bottom plate a'', prevents liquor from flowing into the gas inlet pipe, and also maintains a sufficient body of liquid on the bottom plate to seal the transfer pipe J, leading from the chamber next above.

The operation of my apparatus is very simple, and will require but little attention in practice. Pure water is preferably admitted through the supply pipe H, at the top of the column, into the first chamber, where it removes the last impurities from the partially purified gas which has passed up through the different compartments of the column, and the excess of water as it accumulates in the top compartment flows thence through the transfer pipe J in the seal cup K of the next lower compartment, from which it is forced upward through the cup until it flows over the top thereof and out over the broad flange k', on to the perforated plate C, from which it gradually trickles down through the perforations into the body of liquid contained in the compartment, thereby keeping the surfaces of the plates wet and materially aiding in removing impurities from the upwardly passing streams of gas. The purifying liquid flows from chamber to chamber down through the series in the manner above explained, and becomes more and more concentrated, and especially rich in ammonia, as it progresses toward the bottom compartment of the column, and the concentrated liquor is finally passed off through pipe M, through the usual seal pot, to a liquor tank, not here shown. By regulating the amount of water admitted at the top of the column a very strong liquor may be obtained.

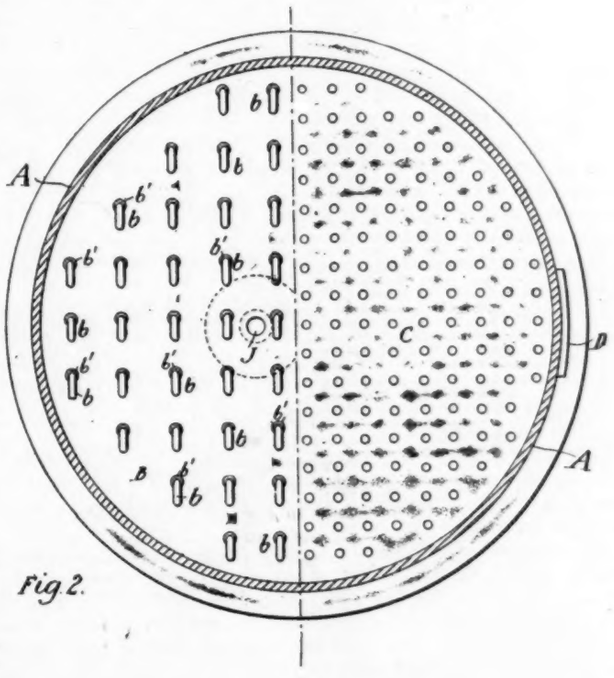


Fig 2.

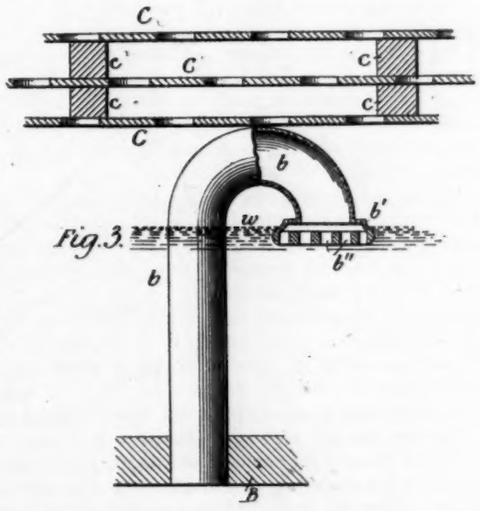


Fig. 3.

Mr. Edgar S. Tweedy, one of the organizers of the Danbury (Conn.) Light Company, died at his home in that city about a fortnight ago. He was born in Danbury in 1808, and was one of its most prominent and respected citizens.

Kenevel's Process of Gas Manufacture.

On September 27th, 1892, U. S. Letters Patent were granted to Mr. Jeannot W. Kenevel for an "improved process of manufacturing gas," the following description of which is from the specifications furnished by the inventor:

The invention relates to a new and improved apparatus for manufacturing gas for heating or illuminating, or both purposes, and the main objects of the improvement are to provide means for the production economically of gas, whether it be a heating gas, an illuminating gas, or a compound of the two. Generally stated, the proceeding for carrying out the purposes for which the apparatus is adapted, is the following:

A gas is first generated by injecting steam, and afterward, preferably with the steam, a hydrocarbon, into a mass, or into the products of combustion rising from a mass of incandescent carbon (coke, coal). The resultant hydrocarbon gas in a highly heated condition is used for generating coal gas, by heating therewith a retort, or series of retorts containing coal, which retort gas and hydrocarbon gas are led off and cooled and purified and then combined. Thus the product of the primary generation, which is deprived of a large portion of its carbon by consumption thereof under the great heat to which it is subjected on its way to the point of mixture, and which would, therefore, form a fuel gas, is bountifully enriched with carbon by the mixture, thus greatly enhancing the illuminating quality of the compound and rendering it a gas of a high degree of illuminating power.

The economy in the foregoing procedure lies not only in utilizing the heat of the primary generation for generating the retort gas, whereby its own heat is materially reduced, and so requires the less cooling down to a proper temperature for mixture with the coal or retort gas, but the residuum in the retort or retorts is a good marketable coke. Continuing, the inventor says:

I also provide means for saving and utilizing the coal tar precipitation from the gas products by passing them through hydraulic mains, and supplying therefrom the precipitated coal tar (hydrocarbon) to the primary generator.

My improved apparatus is also adapted for maintaining separate the product of the primary and that of the secondary or retort generation, whereby the former may afford a strictly fuel gas while the latter may afford a strictly illuminating gas, both being simultaneously generated, the one by the other. And I still further provide means for the generation of hydrogen gas to be furnished from the apparatus, according to desire, either by itself, as a heating gas, or mixed with the coal gas product of the retort, to greatly enhance the heating quality thereof.

My improved apparatus is represented in the accompanying drawings; in Figure 1, by a view in longitudinal sectional elevation, the section being taken on the line 1–1 in Fig. 2, and viewed in the direction of the arrows; in Fig. 2, by a plan view, partly in section on the line 2 in Fig. 1, and regarded in the direction indicated by the arrow; and Fig. 3* is a broken view, enlarged, showing in sectional elevation the construction of the primary or hydrocarbon gas generator.

A^1 is the primary generator, comprising a fuel chamber; A^2 over an ashpit B, from which it is separated by a suitable grate n, and built in a brick structure A, containing besides two heat storage chambers C and C^1, formed with firebrick checker work or other suitable material, and between the latter a retort chamber D. A magazine E (Figure 3) leads downward into the generator chamber A^2 from its top, to or about to the line of the fuel bed V, from a hopper E^1, for containing the supply of coal, and communication of which with the magazine is controlled through the medium of a suitable valve indicated at t; and a steam boiler F, into which leads a valve controlled water supply pipe q, envelops the magazine and has a steam outlet pipe p, branching downward, with a valve s in the branch, and terminating at its lower end in a steam jet p^1, and branching upward into the top of a hydrocarbon or coal tar holder G, from the base of which a discharge pipe o, containing a valve s^1, leads into the rear end of the steam jet p^1, which may thus be used to operate to inject the coal tar supply into the generator A. Air supply pipes, or tuyeres n, lead into the base of the chamber A.

The generator chamber A_2 communicates through a passage m with the checker chamber C, separated from the retort chamber D by a diaphragm l, having an opening l^1 at its base; the checker chamber C^1 being separated from the retort chamber by a diaphragm k, having an opening k^1 at its upper end.

H H are retorts, preferably of the cylindrical form illustrated, and formed either of metal (cast iron) or of other suitable and more refractory material, and each being provided at both ends with caps H^1 and H^2, operating when closed to tightly seal the retorts, and being adapted to be readily removed, the former for permitting the retorts to be filled and the latter for permitting the residuary contents (coke) to be discharged into a pit H^3 and saved. For a purpose hereinafter explained, I prefer to provide the retorts in two series, each of which may consist of two rows, as represented in Figure 2, the series on one side communicating from their upper ends through pipes i, connecting the retorts in transverse pairs, with one hydraulic main I, and the series on the opposite side similarly communicating through pipes I^1, with another hydraulic main K.

By so dividing the retorts into sets, one set may be full of coal and having gas generated in it, while the other is being emptied of coke and refilled with coal, thereby avoiding the necessity for interrupting the desired continuity of the operation for replenishing purposes.

A third hydraulic main L is provided at the end of the apparatus containing the checker chamber C^1, which communicates with that hydraulic main, at one end thereof, controllably through an outlet pipe w, containing a valve w^1. From the opposite end of the hydraulic main L, leads an ascension pipe h, whence a descending continuation h^6 thereof leads into the adjacent end of the hydraulic main K, connected from its opposite end by a pipe h^1, with a manifold h^2, which, in turn, is connected by a pipe h^3, with one end of the hydraulic main I, provided at its opposite end with a gas outlet conduit d. The pipes h^1 and h^3 form tar overflow conduits from the respective hydraulic mains to the manifold h^2, into which also leads an overflow pipe h^4, from the hydraulic main L. A branch a connects the ascension pipe h with the hydraulic main I, to lead into the latter the gas from the main L, when the retorts on the side of the apparatus at which the main I is located are in use, and suitable valves are shown to be provided to control the direction of the gas.

M and M^1 are hydrogen generators, in the form of cylindrical tanks or chambers, containing charcoal and scrap iron or other refractory material, such as limestone, flanking the pipe w, and connected from their bases by valve-containing pipes u, with the checker chamber C^1. At their upper ends the generators M and M^1 communicate respectively through pipes g and g^1, with the outlet pipes d and c of the hydraulic mains I and K, between valves e and e^1 in each of the outlet pipes.

The operation is as follows:

A bed of coal in the generator A is blasted with air through the tuyeres n (which may, but not necessarily, continuously supply air to the base of the fuel bed throughout the operation, but only in quantity to promote combustion to an extent that will maintain, against the cooling effect of the steam, the incandescent state of the fuel bed required for continuity in the gas making proceeding), until it is raised to a state of high incandescence, the retorts H, or at least one set thereof, having meantime been filled with suitable coal. The heat in the chamber A^2 generates steam in the boiler F, preparatorily filled with water through the pipe q, and which tends to prevent overheating or heating to decomposition of the coal supply in the magazine E and hopper E^1.

When steam has been sufficiently generated in the magazine shielding boiler F, but preferably not until it has been so superheated as to facilitate its decomposition by the heat in the chamber A^2, the valve s is opened to admit steam into the generator A^1, and with it, if desired, by opening the valves s^1, hydrocarbon from the holder G, the supply in which, if used (though it need not be) from the start, may be from a source extraneous to the apparatus, though I intend that thereafter the supply, if used, shall be from the coal tar deposits in the several hydraulic mains, forced into the holder G, through a pipe b, by a suitable pump P, communicating with the manifold h^2. The products of combustion pass from the chamber A^2 through the passage m into the heat storage or checker chamber C, heating it eventually to a white heat, which thereafter tends to fix the hydrocarbon gas passed through it, and from the chamber C the hot gas passes below the diaphragm l into the retort chamber D, heating the retorts therein and generating coal gas from their contents. From the retort chamber the gas, reduced in temperature by imparting heat to the retorts, passes over the diaphragm k, through the heat storage or checker chamber C^1, eventually raising and maintaining the latter at a white heat, which still further fixes the hydrocarbon gas product passing through it. From the chamber C^1 the gas may be passed through the hydraulic main L, wherein it is cooled and purified of coa tar and ammoniacal vapors. If this product is to be used for heating purposes, it may be led through a pipe h^5, branching from the ascension pipe h (then having its valve w^2 closed) to the point of consumption or storage.

The coal gas from the retorts H passes, as it is generated, through the pipe i or i^1 into the hydraulic main I or K, wherein it is cooled and

* As Figure 3 relates merely to the construction of the boiler F, magazine 3, of Fig. 1, the same is not reproduced.—Ed. A. G. L. J.

Fig. 1.

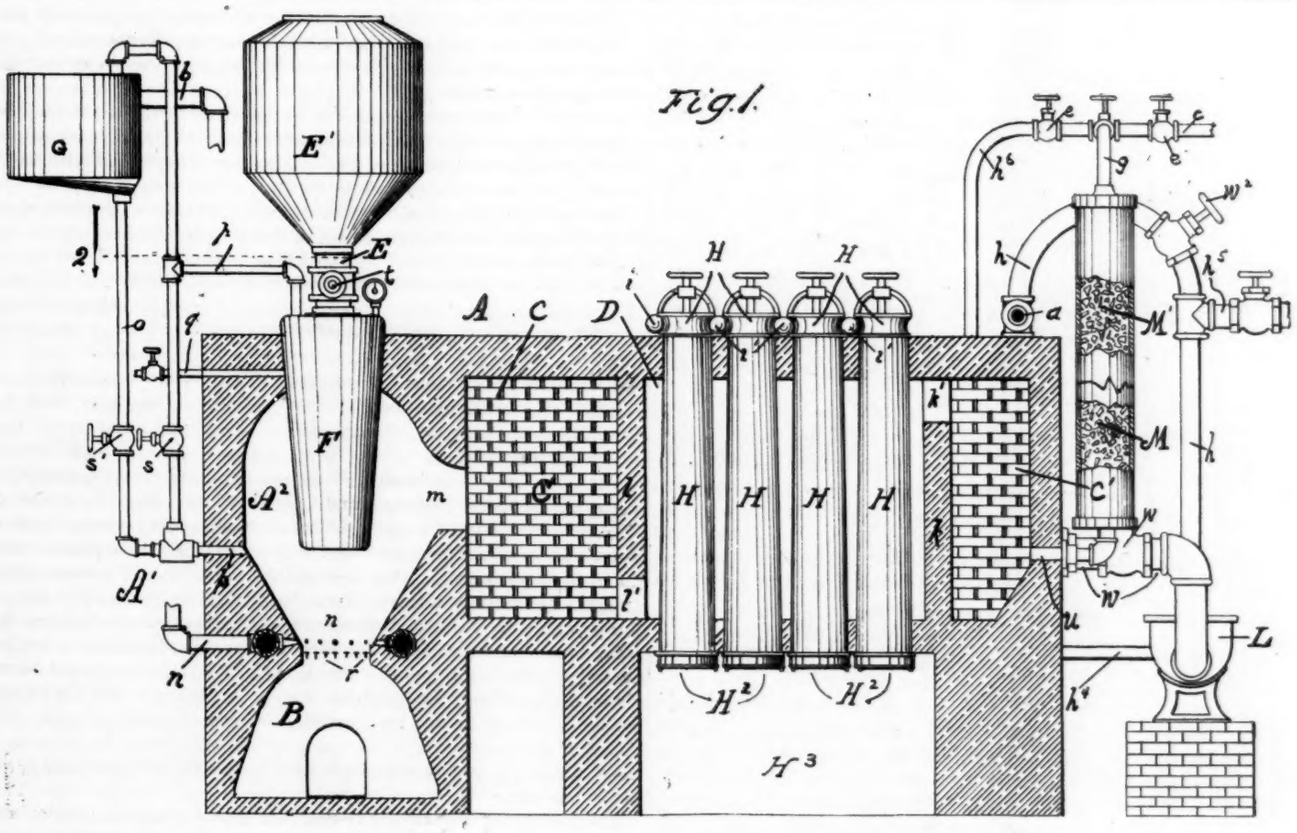
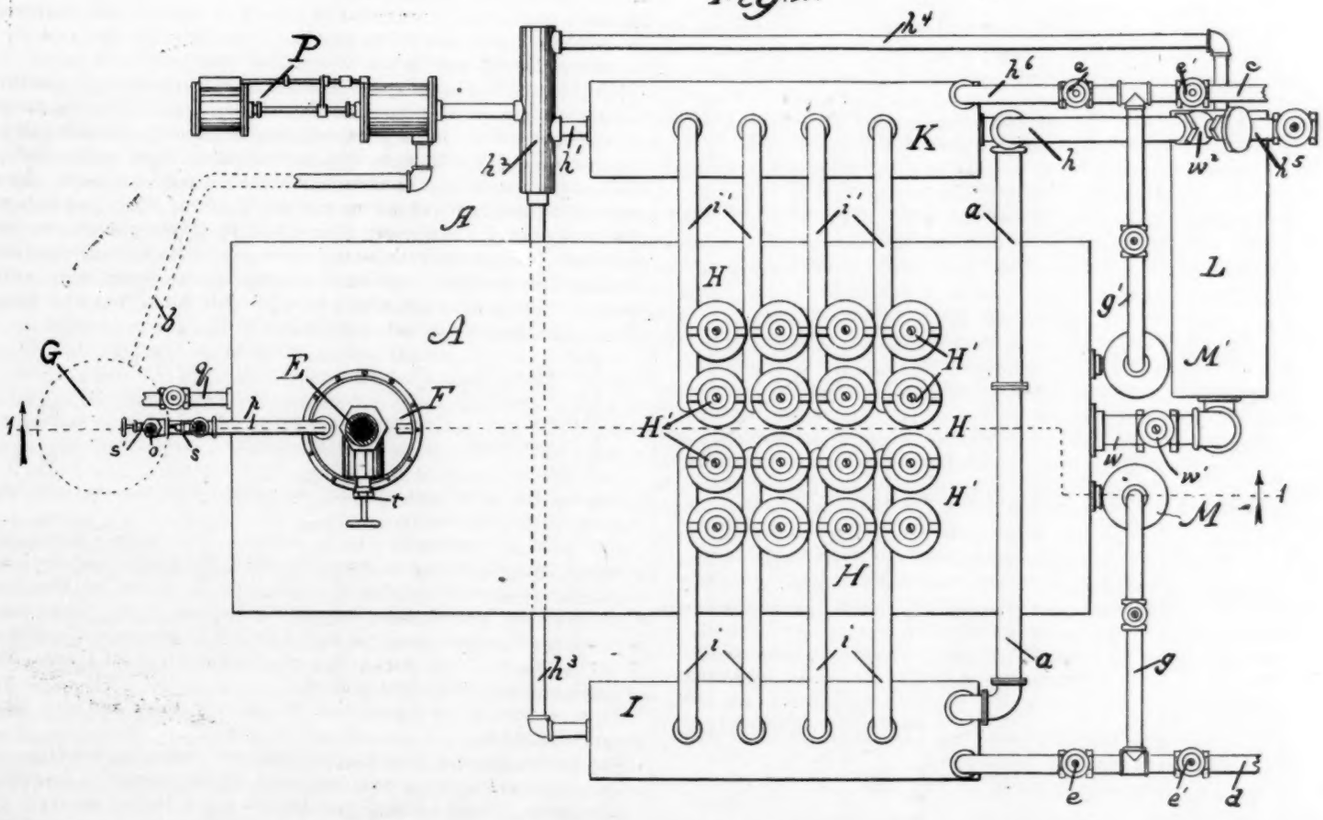


Fig. 2.



purified of coal tar and ammoniacal vapors; and it also, if designed for illuminating purposes, may be led through the outlet pipes *d c* directly to the point of consumption or storage. Of course, for further purification, the gas will be passed on its way to the point of consumption or storage through washers or scrubbers.

To produce the compound of hydrocarbon and coal gases, and thus a gas rich in carbon and hydrogen, with resultant great illuminating and heating properties, the proper valves are turned to cause the gas from one hydraulic main *L* to enter and mix with that in the hydraulic main *K* or *I*, whence it is conducted off through the pipe *c* or *d*, as the case may be.

If it be desired to produce from the generator A^1 a gas rich in hydro-

gen, that may be done by closing the pipe w and admitting the intensely heated hydrocarbon gas from the checker chamber C^1 up through one or the other (depending on which set of retorts is in operation) of the iron scrap and charcoal-containing chambers $M M^1$, whence the gas will emerge and be conveyed to the point of use or storage through pipes g^1, c, or $g\ d$. The refractory material in the chambers $M M^1$, heated by the gas from the checker chamber C^1, operates as a heat storage medium to maintain the required incandescent state of the charcoal, whereby sufficient of its carbon shall be burnt out to adapt it to take up the carbon constituent of the hydrocarbon gas and convert the latter the more into a hydrogen gas.

The accumulations of coal tar deposits in the several hydraulic mains overflow into the manifold h^3, whence the pump P conveys the coal tar to the holder G, from which it may be forced by the steam from the branch steam pipe leading into its top and the steam jet p^1, into the chamber A^2 to supply hydrocarbon thereto.

It should be suggested that the capacity of my improved apparatus may be increased without proportionately increasing the dimensions by multiplying the number of generators A and other parts about a single retort chamber.

[Concluded from page 402.]

An Investigation of Coals for Making Coke in the Semet-Solvay Ovens, with the Recovery of Ammonia and Tar; and Remarks on the Sources of Ammonia.

[A paper read by Mr. J. D. Pennock, Syracuse, N. Y., before the February meeting of the Am. Inst. of Mining Engineers.]

What Temperature in the Gas Retort Yields the Most Ammonia.—Charles T. Lewis finds that at very low distillation temperature the yield of ammonia is low; that a medium temperature brings out a maximum, and that beyond this higher temperatures result in a slightly diminished production. The following are the different temperatures which are expressed by the yield of gas in cubic feet per ton of coal:

Temperature.	Coal Yielding Cu. Ft. per Ton	Ammonia (NH^3) per Ton of Coal.	Sulphate $(NH^4)^2SO^4$ per Ton of Coal.
Highest	11,620	7.411 lbs	28.75 lbs.
Medium	10,162	7.894 "	30.62 "
Lower	9,431	7.504 "	29.11 "
Lowest	7,512	6.391 "	24.79 "

The Temperature at which Ammonia (NH^3) is Decomposed.—When gas retorts are maintained at very high temperatures, there is a possibility of dissociation of the ammonia. This takes place in gas retorts and closed coke ovens at lower temperatures than in gas producers.

Ramsay and Young have investigated the decomposition of ammonia at different temperatures with the following results:

1. In a porcelain tube filled with broken pieces of porcelain:

Temperature Centigrade.	Per Cent. Decomposed.
500	1.57
520	2.53
600	18.28
620	25.28
680	35.01
690	47.71
810–830	69.50

2. In an iron tube filled with broken pieces of porcelain:

Temperature Centigrade.	Per Cent. Decomposed.
507–527	4.15
600 (current very fast)	21.36
600 (current slower)	34.44
628	65.43
676–695	66.57
730	93.38
780	100.00

3. In a plain glass tube filled with fragments of broken glass tubing. At 780° C., 1.72 per cent. was decomposed.

4. In a plain glass tube lying in an iron tube. At 780° C., 24 per cent. decomposed.

5. In a glass tube filled with strips of ignited asbestos. At 520° C., 2.90 per cent. decomposed; at 780° C., 100 per cent. decomposed.

6. In a plain iron tube (no oxide of iron present). At 780° C., 100 per cent. decomposed.

It will thus be seen that under the most favorable conditions ammonia begins to decompose at about 500° C. The nature of the surface of the vessel has a very great influence on the decomposition.

The Distribution of Nitrogen of Coal in Making Illuminating Gas.—William Foster accounts experimentally for the nitrogen of coal during carbonization in the following way; the coal treated containing 1.73 per cent. nitrogen:

Per cent. nitrogen evolved as NH^3 in distillation, 0.251; per cent. nitrogen evolved as cyanogen, 0.027; amount of nitrogen in coke furnished by 100 parts coal, 0.842; nitrogen from 100 parts of coal unaccounted for, the larger portion of which is presumably present as free nitrogen in the coal gas, 0.610. Total, 1.730 per cent. (Watson afterwards found coal tar to contain 1.66 per cent. nitrogen.)

If these figures are further reduced to percentages on 100 parts of nitrogen, their relation to each other becomes more intelligible.

	Per Cent.
Nitrogen of coal evolved as ammonia (NH^3)	14.50
" " " cyanogen	1.56
Nitrogen present in the gas as elementary nitrogen	35.26
Nitrogen remaining behind in the coke	48.68
	100.00

Gas Producers.—In his address before the Society of Chemical Industry, in 1889, Mr. Ludwig Mond very fully describes his process of obtaining ammonia from gas producers. Messrs. Rickman and Thompson obtained patents for a process for the formation of ammonia from the nitrogen of the air. They accomplished their object by passing air and steam through a deep coal fire. Mr. Mond, in his experiments on this process, found that though some ammonia was obtained, there was twice as much ammonia formed when the coal was burned at a moderate temperature by means of steam alone. Though burning with steam alone produced the most ammonia, Mr. Mond soon saw that the process could not be carried out economically on the commercial scale. He therefore devoted himself to the study of so regulating the running of the common gas producer with air and steam as to form and recover the most ammonia.

The gas producer he uses is 12 feet long and 6 feet wide; steam and air are forced in at the bottom; the ashes drop from the producer into a water lute below; the gas passes off at 450° C., from the center at the top into a rectangular tank, partially filled with water, which is sprayed up, and partially absorbs the ammonia. From here the gas, at a temperature of 100° C., goes to a scrubber filled with perforated bricks, in which the ammonia in the gas is absorbed by sulphuric acid. The resulting sulphate of ammonia liquors are evaporated and made into crystals of sulphate $(NH^4)^2SO^4$. From this tower the gas, freed of ammonia and at a temperature of 80° C., passes to a second tower filled with wooden blocks, over which cold water flows and condenses the steam. This water, thus heated, is pumped to the top of tower No. 3, and in turn gives up its heat to the air, which must be heated before it goes to the producer. The gas from the second tower goes to the boilers, where the amount of gas produced from 1 ton of coal makes steam in quantity equal to 75 per cent. of that which 1 ton of coal would make by hand firing. The composition of the gas is:

	Per Cent.
Carbonic acid	15
Carbonic oxide	10
Hydrogen	23
Hydrocarbons	3
Nitrogen	49

The coal Mr. Mond uses is slack, containing 1.5 per cent. nitrogen and 33 per cent. volatile matter.

The Yield of Ammonia.—In November, 1887, when I visited the ammonia soda works at Northwich, England, Mr. Mond was working an experimental producer, and 16 more were in process of erection. These have now been working successfully for four years. The actual working result is the production of 70.6 pounds of ammonium sulphate $(NH^4)^2SO^4$, from 1 ton of coal. This is a high yield, about three times as much as is obtained from gas works.

Three per cent. of tar is produced, but is very thick and is of little commercial value.

The disadvantageous feature of this process of recovering bye-products is the enormous volume of gas from which a small amount of ammonia is to be taken. From 1 ton of coal 160,000 cubic feet of gas (at 0° C. and atmospheric pressure) are formed, and this volume is increased by 80,000 cubic feet from the steam admitted. The complete removal of the ammonia is only accomplished by the use of acid. In coke ovens and gas works the lowering of temperature and spraying with water is sufficient to remove all the ammonia.

Ammonia from Coke Ovens.—It was early known that in our method of making coke in the bee-hive oven there was a waste of the valuable

bye products, tar and ammonia. Thus far, gas works have been able to supply the wants of this country as regards ammonia; but as the works for making illuminating gas adopt the water gas plan, and as the agricultural demand for nitrogen in the form of ammonia increases, we shall be forced to reconstruct our ovens to save the ammonia. That time is upon us, and it will not be long before the greater part of our ammonia will be a bye product of the coke oven instead of the gas retort.

England's gas works do not begin to supply the demand for ammonia and a soluble form of nitrogen for agricultural purposes. She imports annually thousands of tons of sodium nitrate from Chili to furnish the nitrogen for her depleted soil.

B. H. Thwaite says 120,000 tons of nitrogen are annually absorbed by the vegetable growth of England, wheat absorbing 37,000, barley 27,000 and oats 57,000 tons.

To compensate for this loss it is necessary to employ 573,000 tons of ammonium sulphate or purchase from Chili 734,000 tons of sodium nitrate, at a cost of $35,000,000. One third of the fuel consumed, if treated rationally, would supply 573,000 tons of ammonium sulphate, and England would be independent of foreign supply.

During the year 1890, in the United States, 16,100,000 tons of bituminous coal were converted into coke. If all this coal were carbonized in Semet-Solvay ovens, the ammonia recovered, at 13 pounds ammonium sulphate per ton of coal, would be 103,150 tons of sulphate $(NH^4)^2SO^4$.

Types of Ovens.—The different types of open ovens and of closed ovens designed for the recovery of bye-products, are:

Systems Not Using Bye-Products.	Using Tar Vapors and Gases as Fuel for Heating Retorts.	Ovens Adapted for Recovering Bye-Products and Utilizing the Gas as Fuel.	
		A.	B.
		Admitting Air and Partial Combustion of Coal.	Closed Ovens.
Meiler. Bee-hive Oven.	Appolt Oven. Coppee Oven.	Jameson's Oven.	Knab. Pernolet. Simon-Carves. Otto-Hoffman. Semet-Solvay.

The Meiler.—The Meiler, or mound, closely resembles that constructed for producing charcoal from wood. By reason of the desulphurizing action of steam derived from the moisture at the base of the Meiler, the coke obtained from it is quite free from sulphur. The ground at the base is often kept damp that moisture may be absorbed. Meiler coke is not as hard as oven coke. The bee-hive oven belongs to this class; it wastes all the bye-products, but produces a coke that is unsurpassed in quality.

Appolt Oven.—The idea in the construction of the Appolt and Coppee ovens was the utilizing of the gaseous products of the process of coking for heating the retorts. The principal feature of the Appolt oven is that the flames and gases, instead of passing up the flue through the center of the dome, as in the bee hive, into a main flue, and so to the chimney, pass into flues surrounding and enveloping the inner case of the oven, where sufficient air is admitted to effect perfect combustion. The bottom of the Appolt oven is a movable plate, secured by screws and cross bar, and thus the coke is readily removed. The quality of the product is excellent.

Coppee Ovens.—The Coppee oven resembles resembles Appolt's, but the gases and vapors descend from an aperture in the upper part of the oven (by vertical flues heating its sides and supplied with air by means of suitable apertures to insure complete combustion) to flues passing under the bottom, which the flames strongly heat. A main flue then carries the hot gases to do further duty in heating steam boilers before they finally pass to the chimney.

Jameson's Oven.—Jameson modifies the bee-hive oven by substituting for the usual floor of the oven on which the coal is carbonized a floor of perforated quarrels, supported on sleeper walls, these perforations being connected with a short vertical flue underneath the floor, from which a pipe passes at right angles towards the hydraulic main, situated some little distance from the ovens. A branch thus proceeds to this main from each oven in a battery of ovens, and, just before reaching the main, the down pipe from each branch is furnished with a cock for regulating or stopping the exhaust in the oven. After the removal of the ammonia, the gas is used for producing steam.

The ammonia recovered in the Jameson oven is 7 to 9 pounds of sulphate per ton of coal. The Jameson oven was alleged to cost little more than the bee-hive, which it was expected to supersede, inasmuch as by it the bye-products were obtained. But the tar obtained, on account of the low temperature of the ovens, is of inferior quality, and finds no market. It is lighter than water (having 0.96 specific gravity); contains neither naphthaline nor anthracine; its oils are useless for lubricating or illuminating; the phenols obtained are of little value, and the paraffine extracted is inferior. In fact, a distillation product is obtained peculiar to the low temperature employed, and without commercial value.

Closed Ovens.—M. Carves was the first to devise and construct a closed oven designed for the recovery of tar and ammonia.

The Simon-Carves, the Semet-Solvay and the Otto-Hoffman are all closed ovens, in which a purely destructive distillation takes place. These ovens are the outcome of Knab's oven, an early attempt in this direction, which was not successful because a sufficiently high temperature was not obtained. Pernolet worked on similar ideas; but his low temperatures produced an inferior tar. The Simon-Carves, Semet-Solvay, and Otto-Hoffman are similar in construction, all having regenerators for heating the air before it unites with the gas (from which the ammonia and tar have been recovered) and is returned to the ovens.

The Semet-Solvay oven is 30 feet long, 14 inches wide on the side of the steam ram (used for forcing out the coke), and 15 inches on the other, and 5 feet 8 inches high. The advantageous feature of the Semet-Solvay oven is that the wall of the oven is composed of fire clay retorts, 3 in number, jointed together one above the other by groove and tongue. Through these retorts or flues passes the burning gas, which, through the thin 3-inch walls of the retort produces intense heat in the oven. By means of 2 airtight doors at each end, and these jointed walls the oven is kept perfectly airtight; and hence a high yield of good coke is obtained. This result is partly due to the narrowness of the oven, which has 10 inches less width than the Otto-Hoffman oven (30 feet long, 2 feet wide and 5 feet 3 inches high.)

Quality of the Coke from Closed Ovens.—George Lunge says: "The appearance of the coke generally differs from the bee-hive coke; it usually lacks the brightness and columnar structure of the latter, it is more in the form of large circular blocks, of great strength and density and less liable to break in filling, in transit, or in tapping."

The distillation products, tar and ammonia, in the closed ovens are similar to those from gas retorts; yet the coke from gas retorts is of poor quality, whereas that from closed ovens is good. Watson Smith accounts for the difference in this way: In the closed oven a large charge of coal (4½ tons) is used, and is piled up to a considerable height (5 or 6 feet); the thickness of the mass is also considerable (about 15 or 20 inches). As in the retorts of the gas works, the mass soon attains a coked condition, but being thicker, and hence penetrated more slowly, it attains a more thoroughly coked or pasty stage than the thinner mass on the gas retort bottoms can do, before beginning to set again in the incipient stage of the process. But furthermore, in the closed ovens the superincumbent mass of some 6 feet in height introduces a new and important factor in the production ultimately of a more solid article. The semi fused fuel is maintained in a soft condition to a late stage by the high temperature of the oven, and becomes thus pressed by its own weight, and sinking down gives on cooling a hard, solid mass. Finally, with so large a charge as 4½ tons, charged under a certain gaseous pressure and with a thickness of material considerably larger in proportion than is found in gas retorts, he believes that during the escape of the tar vapors from the decomposing mass a portion of these must suffer almost complete coking, the pores of the mass becoming thus filled up, whereby the yield of the coke is increased and greater solidity is obtained.

That the prejudice against closed oven coke has been overcome in Germany and France, is shown by the great increase in the number of ovens constructed in the past few years. The records show of the Otto-Hoffman type of ovens the following in Germany:

Year.	Ovens at Work.
1884	40
1885	210
1889	605
1892	1,205

There are at present 205 ovens of the Semet-Solvay type in operation, and 140 in process of erection.

Yield of Coke, Ammonia and Tar from Closed Ovens.—The greatest number of ovens of the Semet Solvay kind is at Havre, France, where 100 are running successfully. The charge of coal is 4 tons to an oven, which is drawn every 22 hours; the coal used contains only 16 to 17 per cent. of volatile matter, and the full theoretical yield of coke is obtained

by reason of the tightness of the oven. In actual practice the yield is 81 per cent. obtained. As regards ammonia and tar obtained at Havre, where poor coal is used, 14 pounds of ammonium sulphate and 31 pounds of tar is the product from 1 ton of coal. At the Brunner-Mond soda works at Northwich, England, where a better coal is used, 25 to 27 pounds of ammonium sulphate and about 82 to 84 pounds of tar are obtained from 1 ton of coal.

Benzine from Closed Coke Ovens.—According to Lunge 1 ton of good bituminous coal yields about 11,000 cubic feet of gas containing 11.7 kilos or 25.7 pounds of benzine. By reducing the temperature of this gas to—70° C. this benzine is precipitated out of the gas. Of course the removal of the benzine would injure the illuminating qualities of the gas, and it would not be advisable to remove the benzine from such a gas.

The best result thus far obtained in removing benzine from coke oven gas is 17 pounds, or about 69 per cent. of the theoretical amount.

Ammonia from Blast Furnaces.—The least developed source of ammonia recovered from the nitrogen of coal is blast furnace gases. Of course this is only practicable where raw coal is used as fuel, the upper part of the furnace becoming a coking chamber. The difficulty here is the removal of a small amount of ammonia from a very large volume of gas.

Lunge states that at 260° C. the gas containing this small amount of ammonia occupies a volume of 230,000 cubic feet or 13 times that from a ton of coal burned in a retort. There is a further objection to attempts at the removal of ammonia from these gases, namely, the thermal loss due to condensation and cooling, which amounts to 7.4 per cent. of the sum of the sensible heat of the gases.

Thermal Storage for Central Stations.

[A paper read by Mr. George Forbes before the National Electric Light Association, St. Louis Meeting.]

When asked to give you a paper on some electric lighting subject, it seemed to me that I could not choose a better one than "Thermal Storage for Central Stations," which has had so much attention directed to it lately in England. It has long been evident that storage of some kind might lead to great economy in central station work. The reason of this is that the demand for light has, in most cities, a maximum of only two or three hours of the day. Not only do we require to have plant lying idle all the rest of the day, but the expense of working for those few hours is increased by its temporary character. This loss of economy has occurred both in engines and boilers. Underloaded engines are very inefficient and use up a lot of coal. The defect is, however, got over in all important central stations by having at least a few engines of small power to carry the day load. We are thus able to have engines in use always working at their most economical load; that is, near full load. The other loss in economy comes from the boilers, which have to be fired up and heated only for a few hours' work, and then banked or else allowed to cool down. This loss cannot be overcome by working the ordinary plant in any special manner. At the Kensington station in London, where the engines are always working at an economical load, 5 pounds of coal are used per electrical horse power per hour, whereas in tests of 24 hours' duration, made on the same plant, with all the boilers doing full work, only 3½ pounds of coal were required for the same duty. If, then, we could have storage of any kind by which power is absorbed at times of light load and given off at times of heavy load, we should save 1½ pounds of coal per horse power per hour.

Many people have thought that storage batteries would overcome this trouble. It does so; but at an enormous capital expenditure in storage batteries, with a loss of 20 per cent. in the energy given to the batteries, and with a depreciation account which no one would put at a less figure than 12 per cent. per annum.

I have previously proposed that in a hilly country the boilers and engines should be working all the 24 hours, at the rate of the average demand, and that they should be used to pump water through a pipe to a high reservoir at least 500 feet above the pumping station. At the lower end of the pipe turbines are placed driving dynamos. During the daytime the reservoir is being filled, and in the evening it is being emptied. This produces a saving in boilers and the substitution of cheap turbines and a small number of efficient pumping engines for a large number of less efficient engines to drive dynamos. It also reduces the coal consumption from 5 pounds to 3 pounds per horse power per hour. In a paper read last year before the British Association for the Advancement of Science, I showed that this plan could easily be adopted at Edinburgh, in Scotland, the saving in capital and annual expenses being both very large.

But it is not every city that has these advantages, and I wish now to introduce to your notice the excellent scheme which has been invented by Druitt Halpin of England.

He proposes to put up boilers only of the average capacity and to work them day and night. At times of light load the steam is carried through pipes into large iron reservoirs of cheap construction, and is used to heat up the water in these reservoirs to a high temperature and pressure. When the heavy demand comes on in the evening, steam is drawn from these reservoirs. The losses of heat from radiation from the reservoirs can be made very small indeed; with proper lagging, in fact, quite imperceptible.

This is the general scheme of Mr. Halpin's plan. But it has two advantages which are not so apparent at first sight. One is the purity of water supplied to the boilers. Mr. Halpin's pumps feed water into the hot reservoirs, where impurities are precipitated in a place where they can do no harm. The boilers, on the other hand, are fed from this pure water in the reservoirs.

The other incidental advantage of the system is that priming in the boiler does not cause any inconvenience, as the steam is all supplied to the engines from the reservoirs. Now, it has been found from the experience with the water tube boilers, which are so much used in this country, that only 3 pounds of coal per hour can be burned per square foot of heating surface, on account of excessive priming, instead of the 6 pounds per square foot which we can use with the Cornish or Lancashire boilers, and which might be used with water tube boilers if priming were no objection. Thus it appears that the adoption of Mr. Halpin's system not only reduces the number of boilers that we require, but also doubles the capacity of each boiler.

Mr. Halpin has worked out the relative cost of supplying machinery to the central stations of Berlin: 1, without any storage; 2, with storage batteries, and 3, with thermal storage. He first selected this station, because the output at each hour of the day all through the year was published before any other central station had published similar data. In this system there are four central stations, giving off about 10,000 electrical horse power.

The load at different times of the day is such as to lead to the following data:

Maximum load	7,500 kilowatts.
Mean load	2,030 kilowatts.
Excess of maximum above mean	3,080 kilowatts.
Duration	7.5 hours.

Now, Mr. Halpin claims that he can replace 22 boilers for working in the ordinary way by five boilers and 92 of his storage cylinders, which are cheap to construct, and have, necessarily, a small depreciation. His claims, which, I must admit, seem to be quite well founded, are that while laying out somewhat more capital on his plant, he gets a very large return from the extra capital spent. He sums up the cost of the thermal storage system as follows:

5 Babcock & Wilcox boilers	27,050
Boiler house	9,500
Chimney	4,850
Cylinder house	33,300
92 cylinders	184,000
Total	$258,700

and he puts the cost under the existing system at $182,700.

Now, if we charge 10 per cent. to annual depreciation of boilers and only 5 per cent. on the iron cylinders, which really seems a very fair value, then the annual interest and depreciation comes out almost the same for both systems, thus:

Existing System.

5 per cent. on $182,700 capital	$9,135
10 per cent. on $117,850 boilers	11,785
4 per cent. on $64,850 building	2,600
	$23,520

Thermal Storage.

5 per cent. on $258,700 capital	$12,935
10 per cent. on $27,050 boilers	2,705
4 per cent. on $47,050 buildings	1,900
5 per cent. on $18,400 cylinders	9,200
	$26,740

Annual charges against thermal storage, $3,220; but the annual saving in coal is, in this special case, 7,000 tons, besides the saving in ash removals and firing. Mr. Halpin thus obtains figures giving an annual

saving of $36,530 to pay interest on extra capital of $75,000, with coal about $5 per ton.

Now, the only kind of storage against which Mr. Halpin has to compete, when high land is not available for utilizing water storage, is the storage battery; and from his figures, which seem fair to me, the extra capital required is $732,200, and the total annual extra cost is $110,570, which shows a great advantage in favor of thermal storage.

I consider that all these figures are very conservative, and that in these days, when we are learning to realize the importance of cutting down working expenses in central stations, this system must necessarily occupy an important place. But it is of peculiar interest to me, owing to its applicability to a kind of work to which I have devoted a large part of my time in the last seven or eight years. I refer to the burning of the house refuse and garbage in our cities. The furnaces in which this cremation is accomplished are generally called "destructors." It has been one of the great objects before me of late years to have this title abolished, and to justify their being called "utilizers." The improvements which we have introduced in the methods of burning garbage are so great that I can now undertake to produce the following results:

Taking the ordinary house refuse, consisting of ashes, coal, wood, paper, old boots, vegetables, bones and scraps, crockery, tin cans, iron pots, bottles, and adding thereto occasionally dead cats and dogs, infected mattresses and condemned meat, I can throw the whole of these, without sorting, upon the furnaces, and without producing any offensive odors or dust, I can raise the temperature of the gases where they reach the boilers to over 200° F. From my data as to the amount collected in different houses in England per head of the population, I find that from the house refuse of any town I can supply enough steam to generate electric light at the rate of one 16-candle power lamp per head of the population for two hours every night of the year. By doing this I am saving the municipality from $10,000 to $20,000 per annum per 100,000 inhabitants for the cost of removal of house refuse. I am preventing these objectionable materials from being dumped in the outskirts of the city, where building operations will soon commence, or in the neighboring harbors or lakes, either of which plans is a nuisance and unhealthy. The only resulting material is a clinker, which can be broken up, and which, when mixed with cement, makes admirable concrete or artificial stone for paving, while by itself it makes excellent foundations for roads.

Now, these enormous advantages, of the truth of which we have ample proof from a practice extending over nearly 20 years in England, can be worked at full economy only when the burning of refuse is quite continuous and uniform. To do this we must have storage of some kind. In hilly countries the plan I have advocated of water storage is generally available and very economical. In all other cases thermal storage is far and away the most economical mode of working, and, in this line alone, if in no other, I have always said, from the first moment I knew of Mr. Halpin's invention, that we have here the last item which was wanting in order to do away with the barbarous methods generally adopted for getting rid of house refuse, and, at the same time, utilizing that refuse in a manner that will confer material benefits on all the inhabitants of a great town, and pecuniary advantages on those who undertake the work.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, March 10, 1893.

The London Gas Testing Arrangements—The State of the Gas Industry.—An Accidental Explosion.

At the recent shareholders' meeting of the South Metropolitan Gas Company, Mr. George Livesey, the Chairman, indulged in some plain speaking as to the arrangements under which the testing of the London gas supply is carried out by the gentlemen appointed for that purpose—the Gas Referees. He maintained that these officials were appointed in the interest of the public, and therefore should not complain as to quality or purity of the gas supplied, unless there was a direct loss or inconvenience to the public. They did not take this view of the matter, but set themselves out to carry the strict letter of the law, with the result that the Gas Companies were summoned before the magistrates and fined if infinitesimal quantities of sulphur were found in the gas—quantities so small as to be of no consequence whatever to the gas consumers. Taking, for instance, sulphureted hydrogen, he concluded that when the Act of Parliament set forth that the gas must be free from that impurity, the expression was used in an everyday, practical way, and not in a rigid and accurate scientific sense. The Gas Referees were gentlemen of high scientific attainments, and they had directed their attention to the refinement of the chemical tests applied to the gas, with the result that the Companies were summoned and fined for allowing something less than one part of sulphureted hydrogen to one million of gas. Whereas the presence of impurities on this infinitesimal scale made no difference to the users whatever, the necessity for preventing it involved continual anxiety, trouble and expense at the gas works. The only known way of keeping the sulphur compounds within the prescribed limits was by the use of large quantities of lime, which could not be handled without causing nuisance to a certain extent. The Gas Companies of London were put to an expense of 2d per 1,000 cubic feet of gas in order to meet the requirements of the Gas Referees, or a sum of about £250,000 per annum; and for this expenditure there was no satisfactory return. And he pointed out that this expense did not fall on the Companies, but on the consumers. The Companies earn their full dividends and cannot divide more, so that the expense above named was met by keeping the price of gas at 2d per 1,000 cubic feet more than would otherwise be necessary. So far from justifying their existence by benefiting the public, the Gas Referees had proved an expensive luxury.

The position originally assigned to these Referees was a peculiar one. At the time of their appointment it was an acknowledged fact that coal gas could not, by any known means, be freed from every trace of ammonia and sulphur. So they were allowed to fix limits for these impurities, and in order that these limits should be arrived at in a practical way, one of the Referees was to be an experienced gas engineer chosen by the gas companies. These gentlemen had power to visit the gas works and see that everything was carried out in the best possible way, and to advise the companies as to the methods of purification to be adopted. They commenced their labors by a long series of experiments, with a view of arriving at the reduction of these impurities to the lowest possible degree, and made several recommendations to the companies, which were in every case adopted as far as possible, and a considerable expense was incurred in experiments on a large practical scale. They were not only scientific policemen, watching the gas supply in the interests of the public, but friendly advisers to the companies in the matter of helping them to supply pure gas. The companies have always exhibited a desire to do everything in their power to this end. But of late years the practical commonsense nature of this arrangement has been changed. The original Referees ceased to hold office on account of death and other reasons, and their successors seem to have retained only the police department. The "qualified gas engineer" has disappeared from the Referees' office for some years, to the great disadvantage of the public.

In theory, it is quite correct for the representatives of the public to insist upon having a perfectly pure article, but they must be governed by practical considerations. If they can show that the gas companies are careless, unskilled, or parsimonious in the matter of purifying gas, they have a clear case that admits of no defense; but if, on the other hand, the companies can show that they have spared no trouble or expense in carrying out the recommendations of the best known authorities on the subject, and that neither the referees nor anyone else can explain why an excess of sulphur occasionally manifests itself, there is a clear answer. There is also another view of this question. It is the last straw that breaks the camel's back, and it is the last small traces of impurity that cause more trouble and expense than all the rest. Take, for example, any manufactured product in general use, say soda or white lead. These articles are supplied in a practically pure state, but no one would think of carrying an analysis to the seventh place in decimals. Suppose, however, that a government inspector exercises his right to summon manufacturers who do not conform to this degree of purity, with the result that the selling price to the public is substantially increased to meet additional expenses necessitated by the endeavor to keep within the prescribed standard. Would not such action on the part of the government inspector be characterized as grandmotherly, to say the least. Yet this fairly represents the position of the London Gas Referees. It is a remarkable fact that when once the gas supply gets into the hands of a local authority, the gas examiner drops out of sight, or is reduced to a plain photometrist. Several of our principal towns might be referred to—I avoid the temptation to particularize—where the average proportion of sulphur in the gas, from day to day, exceeds that of the so called excesses for which the London Gas Companies, or more strictly speaking, the London gas consumers have been fined.

If the atmosphere of London was maintained in a state of freedom from smoky and sulphurous matters, there might be some reason in such

vigilance over the gas. But as a matter of fact, if all the sulphur that could not be absorbed by means of oxide of iron was allowed to remain in the gas, and discharged into the atmosphere through that medium, the result would be a mere flash in the pan as compared with the great factory chimneys, the steam engine funnels, the dwelling house stacks, and other sources of soot, smoke and sulphur that are daily discharging into the London atmosphere.

Both of the great London Gas Companies, and also the majority of those in the provinces, have been able to present a considerable improvement in the accounts for the half year ended 31st December last, as compared with the half dozen or so half yearly statements immediately preceding. Coal has been obtainable at cheaper rates and the demand for gas has shown a satisfactory rate of increase. So that notwithstanding a somewhat slack state of the coke market, and the very serious falling off in the items of tar and ammonia, to which I alluded in January, the balance available as profit has in most cases been sufficient to provide the usual rates of dividend, without recourse to the reserve fund. It is just as well to touch upon the reserve occasionally, as illustrating the need for the existence of such a fund, but no one wishes to see this course of action taken too frequently. A noticeable feature of the past winter, also, was the efficient manner in which the maximum demand was met during the heavy season. There is almost an entire absence of complaints, beginning "——in darkness," which at one time were always met with at this season of the year. I mention this as showing that gas companies generally are recognizing the importance of not sailing too close to the wind in the matter of producing power; and also that notwithstanding rumors of electricity, petroleum, cheap water gas, etc., they are not afraid to keep pace and provide for the needs of their gradually increasing business.

A somewhat important law case was tried in London a few weeks since, by which a gentleman recovered £40 damages from the Gas Light and Coke Company for injuries sustained through an explosion of gas, caused by the negligence of the defendants. According to the provisions of the law the jury had to be satisfied that there was negligence, though it does not appear, from a perusal of the report of the evidence in the *Journal of Gas Lighting*, that any actual act of that nature had been committed. The interesting part of the affair was that played by an electric light box. The gas leaked from the pipes and accumulated in this receptacle, upon which the complainant, for some reason or other, had happened to stand. The explosive charge was fired, some say by the electric, and others by a spark from a workman's pick some yards away, the cover lifted and the sufferer was projected upwards after the fashion of a "demon" through a trap door at the theater. So it it is evident that the electric light increases the risks of gas explosions by affording receptacles in which gas may accumulate. Such risk could be prevented by the ventilation of the boxes.

The gas company in this case had been made acquainted with the fact of the leakage, and their workmen were engaged in searching for it at the time that the accident occurred. It appeared from the evidence that they have an excellent system of regularly examining all plug holes, valve boxes, etc., for possible leakages. Their district must be an extremely difficult one to deal with, on account of the number of bridges, viaducts, underground and high-level railways included in it, all of which mean liability to unexpected disturbances and strains upon the main pipes. The mere fact of the rarity of any accident throughout their extensive district is a testimonial to the excellence of their arrangements. But possibly the jury were influenced by the consideration that the complainant's loss of health and time were matters of serious moment to him, whilst the company were so wealthy that they would not suffer by the payment of moderate damages.

Relation of Insurance to Electric Lighting and Power.

In a paper on this subject, read by Mr. William Brophy, at the late St. Louis meeting of the National Electric Light Association, the author remarked:

Those engaged in insurance business and those engaged in the manufacture and sale of electric lighting apparatus, as well as those who furnish electric light and power, have one common end in view, viz., to secure at least a fair return on the capital invested in their business and for their own time and labor. Each of these interests needs the help of the other, and there is no good reason why one should antagonize the other. That this has been done in the past I will not deny, but to say that the insurance companies were wholly to blame for their hostility to the introduction of the electric light would be manifestly unfair, to say the least. Insurance companies have paid dearly in the past for the mistakes of those engaged in the introduction of all modern forms of artificial illumination and many forms of heating.

With the crude methods at first employed for the transmission of the electric current from dynamo to lamps and circuits, fires of more or less magnitude were quite frequent, with consequent loss to the insurance companies. These unfortunate happenings did not tend to cause them to look upon this new candidate with unqualified favor. On the contrary, many were inclined to look on a building equipped with electric lights as worthy of a place on the "prohibited list," while others viewed them as extra hazardous and not to be eagerly sought for by local or special agents even at a very high rate of premium.

How to deal with this new and to most people's minds dangerous element was a most serious question with the underwriters of this country. To many it seemed best to increase rates all along the line where it was introduced, and thus prevent or discourage its use. Had such action been taken there is no doubt but it would have had the effect of retarding the growth of the electric lighting business very greatly indeed. Fortunately this last expedient was resorted to in only a small portion of this country.

The inspector, instead of assuming a knowledge which he did not possess, for the sake of increasing his own importance in the eyes of those who employed him, kept in touch with those whose daily experience enabled them to detect any inherent weakness in the devices and systems of transmission. This enabled him to assist in perfecting the same by advocating all improvements that increased the safety and did not impair the efficiency of the system. In this way the standard of safety has been raised to a degree that approaches perfection, and fire losses caused by electric current decreased, notwithstanding the enormous increase of electric light, power and railway business, and the fears of the insurance companies were in a great measure allayed. In marked contrast with this mode of procedure is that of certain insurance inspectors and others who are now engaged in an attempt to undo all that has been done to bring about an era of good feeling between these two great interests and enable them to work together harmoniously. This attempt at mischief making is all the more reprehensible, owing to the progress that has been made toward harmonious relations at a meeting of your representatives and those high in the councils of insurance associations. With the exception of one or two of those present at that meeting, all expressed themselves in the most friendly terms toward those engaged in the electric business, and desired to cultivate this feeling of friendship.

In the city of Boston the Board of Underwriters has for a number of years maintained a system of electric light inspection, paid for by assessments levied on electric lighting companies, also on firms and individuals engaged in electric construction. The city is compelled by State law to maintain a similar system of inspection. In addition to this, one of the electric lighting companies, whose officers are not possessed of an abiding faith in either of the above-named systems of inspection, makes it a point to inspect all wiring before they will connect thereto.

Yet with all these safeguards and checks on those engaged in electric lighting and construction, some men "claim to see a connection between the growth of the fire loss and the growth of the use of electricity."

The real fact in the case is that millions of insurance have been placed by agents and brokers on property that is far more hazardous than the very poorest electric light plant in the business portion of the city in question. Ordinary prudence having been thrown to the winds in writing such assurance, the inevitable consequences of such folly ensue —viz., disastrous fires. The agent who sees a possible loss of commissions hastens to give a plausible excuse to his companies, by charging the origin of the fires to electricity, and demands an examination of the fire department for not extinguishing them before they were kindled, concealing the fact that his own methods of placing insurance encourage incendiarism and promote carelessness.

In view of the fact that it is now proposed to add a small charge to the rate of insurance where electric lights "are installed in compliance with board rules and specifications," and a charge of 25 cents where they do not meet with the approval of the insurance inspector, I would advise you to pursue the following course: Where a company does its own wiring for its customers, proceed with as much care as though the building in which you are installing wires and fixtures was your own, and you had no insurance on it. Where the work is done by others, inspect every foot of wire, every joint, cut-out, switch and insulator, and on no account turn on current until you are satisfied that it is as safe as it is possible to make it. Do not rely on the uncertain movements of the insurance inspector, or any other system of inspection that

too often fails to inspect. You are the ones whose business will suffer from the bad effects of fires caused by defective wiring.

We now come to the electric light station. Do not rent one end or the basement of a flour, saw or planing mill, and place your machinery in it and expect to get any better than the rates charged on the buildings named above. While they are considered extra hazardous risks, insurance boards in their wisdom (?) will tell you that the introduction of electric light machinery increases the hazard and also the rate. This statement may cause you to smile, but there are those who, by early experience, have found it no laughing matter. Do not place it in some old, abandoned building, for, as in the above case, an increase of rates will follow. Do not set your machinery down on the ground and build a tinder box around it, for besides assuring high rates of insurance, it does not speak well for the business sagacity of the owner. Proceed as though you proposed to do a legitimate business, and for all time. Build your station on solid foundation, the walls of brick or stone, not over two stories high—better only one—solid brick or stone foundations for engines, boilers, dynamos and pumps; a solid brick wall extending 3 feet above roof between boiler and engine room; the floor of boiler room of brick, stone or cement; if building is two stories high, have the boiler room the same, having clear, open space between floor and roof; floors of engine room, if dynamos are not placed therein, can be of iron or stone; if dynamos and other apparatus are in the same room, floor should be 3 inch plank, tongued and grooved, with hardwood floor of 1 inch boards, matched and laid at right angles to, or diagonally on, the plank, the whole laid on heavy square timbers or iron I beams; the roof should be of 3 inch plank, splined and grooved, resting on square, hardwood timbers or trusses or iron or I beams; cover this with slate, tin or gravel, according to pitch; leave the walls bare; do not attempt to improve their looks by covering them with wood, creating concealed spaces; roof and ceiling, ditto; enclose stairways with plank, and provide self-closing doors therefor; cover the doors in brick partition walls with tin; also the frames; do not build a wooden hen-coop or Turkish pagoda on top of roof, and call it a wire tower; build from floor of dynamo room, of brick or tile, a good substantial tower, of ample size for all wires; put them in systematically and not by guess; make switchboard of good, hard, well seasoned wood, skeleton in form, or use the sides of brick or tile tower; if slate switchboard is used, bush all holes through which wires, plugs or other connections carrying high potential currents pass with glass, porcelain or hard rubber; do the same if sides of brick wire tower are used; use this same material where wires pass through floors or other woodwork; secure a supply of water for protection against fire from town or city mains, if available and pressure is sufficient. In doing this have pipe leading into station of ample size. It costs no more to excavate for a 6 inch pipe than it does for a 1 inch, and the difference in cost of pipe is not enough to outweigh the value of an abundant water supply in case of fire, for, like the Texan's revolver, then is the time when you want it and want it bad. If water cannot be secured in this way, make your boiler pumps sufficiently large to throw, when connected together, or working singly, from 300 to 500 gallons per minute, according to circumstance. Remember that all electric apparatus, including dynamos, is very susceptible to damage by fire or water, and by reducing the amount of combustible material in your plants you reduce the possibilities of a large fire and the necessity for a large amount of water.

Do not, if possible, build your station adjoining or too close to such risks as oil refineries, planing, saw or flour mills, grain elevators, etc. If obliged to do so, have no, or as few openings as possible in the exposed side or end, and provide metal covered shutters for these few. Run all your wires in plain sight, leaving ample space between them.

In planning your station, allow for future growth and enlargement, without disturbing the present arrangement of machinery, etc. Store your oil, and if possible your other supplies, outside the station, and if you have a repair shop, do not have it in the second story, attic or basement. It is much better outside the building. If you must have it in the building, do not box it up out of sight, but separate it, if you must, by an open partition or fence from the rest of the building. Divest your own mind of the idea that dirt, grease and slush must be the wedded partner of an electric light station, and impress on those of your employees that an absolute divorce must be granted if the marriage ceremony has been performed. "Cleanliness is next to godliness," but nowhere does this maxim apply with such force as in an electric light station.

Having finished your plant in accordance with the foregoing requirements, you need have no fears of acts of unneighborly conduct or apparent neglect of your property by the ever active insurance agents. Instead of waiting for you to seek them out and beseech them to insure it, they will be as attentive to you as the most ardent young suitor ever was to his lady love. Remember that so-called tariff rates and agreements, that hold insurance associations together for the purpose of maintaining high rates, are but ropes of sand, and that keen weapon, active and oftentimes bitter competition, is continually cutting it up in little pieces, and letting this craft, that should be rightly named "Trust," drift on the hostile shore of independent action.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

In our report of the proceedings of the February meeting of the New England Association of Gas Engineers (issue of March 13, page 367, second column, second paragraph) Mr. Prichard is reported as having said: "The price for electric motors runs from $25 to $60 for a horse power per year." What Mr. Prichard did say, however, was, "The price for electric motors runs from $125 to $60 for a horse power per year," which is something decidedly different; particularly when it is remembered that the Company of which Mr. Prichard is General Superintendent (the Lynn Gas and Electric Company, of Lynn, Mass.) is probably engaged to some extent in the supplying of electric currents for power purposes.

Advices from Portland, Ore., are to the following effect: "The Portland Gas Company has reduced the price of gas from $3 to $2.50 per 1,000 cubic feet, with the following discount when bills are paid at the office within five days from the 1st of the month; 5 per cent. on bills of 1,000 to 10,000 cubic feet; 15 per cent. on bills 10,000 to 20,000 cubic feet; 25 per cent. on bills 20,000 to 50,000 cubic feet. Bills exceeding 50,000 cubic feet, special rate. Gas supplied to gas engines for power, and to gas ranges for cooking and domestic purposes, $1.75 net, and separate meter attached without charge. Additional to the reduction in price of gas, meter rental will be discontinued on bills exceeding 1,000 cubic feet per month—the reduction to take effect on gas consumed on and after May 1st. It is the policy of the Company to make further reduction in the price of gas as the increase in the output will warrant." All of which is positive testimony to the success that has visited the moves made by Mr. J. L. Hallett since his accession to the position of General Manager to the Company.

In addition to the foregoing, respecting the gas situation at Portland, we present the following extracts from a letter recently to hand from a correspondent who has been making visits to a few of the works on the "Coast:" "Portland, Ore., March 13, 1893.—* * * Conversing a few days ago with Mr. Hallett, of the Portland Gas Company, I may say to you that his Company, through the force of certain economies effected over the practice of the former management, has seen the way clear to reduce the price of gas, and to virtually abolish the meter rentals hitherto charged. Under the old rule the meter rent was 25 cents per month, whether the gas bill was 40 cents or $40—which plan looked to me to be an absurdity, in either event. Mind you, the reduction in rates and the abolition of the rental amount to a large falling off in the gross revenues of the Company, but I have it on pretty good authority that the economies amount to a sum round enough to permit the Company's *net* revenue to stand at the point at which it was before. * * * Nearly all the gas coal used here comes from Australia, the cost of coking coal amounting to $6 per ton, and the shale readily brings $20 per ton. Oil costs 10 cents a gallon. So you see, with such prices for the crude material, gas is an expensive article to manufacture. It is, however, confidently asserted that good gas coal will shortly be found in districts close by here. I spent a day or two recently with Messrs. Crockett and Jones, of the San Francisco Company. They, as you know, are building a fine works there, and notwithstanding the prominence of electricity on the Pacific Coast, coal gas leads the van. Tacoma and Seattle have good works, which are ably managed. There is a prospect of a Gas Association on the Coast before long—the sixth baby, I believe, since the New England Association.—L."

Mr. J. H. Cardell, who was formerly in charge of the Roanoke, Va., gas plant, has been appointed Superintendent of the Huntsville (Ala.) Gas Light Company.

The Hazelton Boiler Company, of this city, is building a 500-horse power boiler for the Rochester (N.Y.) Gas and Electric Company. They have heretofore supplied the Rochester folks with three 300-horse power and one 500-horse power boilers, all of which are yielding the

very best results. The Hazelton or "Porcupine" boiler seems to be growing steadily in favor with gas and electric companies; and good reports are heard from it too in the fields of other industries.

MR. J. H. FITZGERALD, Superintendent of the Houston (Texas) Gas Light Company, is about to put down one mile of 12 inch feeder main through the central part of the city, the work to be completed during the latter part of April.

"OBSERVER" forwards the following: "The Lawrence (Mass.) Gas Company announces the following changes in the prices of gas and electric lights: On and after April 1st the price of gas will be $1.60 per 1,000 feet, with 20 cents discount for cash, making the net price, if bills are paid up by the 14th of the month, $1.40 per 1,000 feet. On Edison electric meter bills amounting to $5 per month or over, a discount of 10 per cent. will be made if paid up by the 15th of the month. These changes will take effect on bills to be rendered May 1st."

AT the annual meeting of the Colusa (Cal.) Gas Company the following officers were chosen: President, J. W. Goad; Vice-President, George Hager; Secretary, Joel Boggs; Treasurer, the Colusa County Bank. A noteworthy thing in connection with the meeting was that every share of the stock was voted upon.

"P. R. M.," writing from Sacramento, Cal., under date of March 15, says: "Negotiations which have been in progress for some time were concluded about a week ago, when the title to the Santa Cruz (Cal.) gas works passed from Mrs. Caroline V. Tuthill and Mr. J. B. T. Tuthill to Mr. George Davidson, of San Francisco, and the works were placed under the management of Charles B. Byrne, formerly of Heath & Byrne, of Santa Cruz, through whom the sale was accomplished. Mr. Davidson is a member of the firm of Davidson & Leigh, real estate agents in San Francisco, and these gentlemen also have entire charge of the management of the Crocker estate. For the present no marked changes will be made upon the plant; but the business management of the Company will be on somewhat more modern lines than that which prevailed for some time. It is not unlikely that a cut in the rates will be one of its first moves."

Mr. H. H. Walker, Manager of the Rockville (Conn.) Gas and Electric Light Company, has published the following notice: "We are now prepared to furnish the incandescent electric light in all buildings, places of business and dwellings. Those wishing them put in may leave their orders at the office, Room 5, Henry Building, where rates may be obtained. A list of applicants has already been started, and work will begin in a few days. We have decided not to connect our service wire with any wiring already done, or to be done hereafter, by outside parties, unless it be accompanied with a written inspection report and approval of the New England Board of Fire Underwriters and our Company. This decision we feel compelled to make on account of the danger from fire resulting from indiscriminate wiring by irresponsible parties. We prefer to do the wiring ourselves, so as to make sure of the character of the work and to accomplish the best results with safety and satisfaction to our patrons."

WE understand that the complete consolidation of the Ottawa (Can.) Gas Company and the Ottawa Electric (Arc) Light Company has been perfected, the purchasers being parties hitherto not identified with either Company. The names of the real proprietors of the plants will not be made public until the date of the annual election of the Gas Company, which will occur early next month. It is pretty well settled, however, that Senator Clemow, Col. Allan Gilmour, Mr. Robert Blackburn and Mr. Samuel Howell are largely interested in the transaction. The capital stock of the two Companies amounts to $650,000, and as many of the shareholders in the Gas Company were also shareholders in the Arc Light Company, there never was any notable difference of opinion as to how the interests of each could be best conserved.

IT is said that the residents of Arlington and Winchester (Mass.) will appeal to the Board of Gas and Electric Light Commissioners for a revision of the gas rate. The present charge is $2.75 per 1,000 cubic feet. The Arlington Gas Company supplies gas to both the districts named.

THE Directors of the Citizens Natural Gas Company, of Stockton, Cal., have levied an assessment of $10 per share, for the purpose of sinking another well. So far the Company has one well to show for the moneys expended, the yield of which is put at 15,000 cubic feet per diem.

JOSEPH ALVARD, while at work driving joints on a line of pipes that was being put down by the West Duluth (Minn.) Gas and Water Company, claims that he was severely injured through the negligence of others employed by the Company, and sues for $25,000 damages. The Company denies any responsibility, claiming that Alvard's carelessness was alone responsible for the injuries he sustained.

A PINTSCH gas plant has been installed in the yards adjoining the station of the New York Central Railroad, at Buffalo, N. Y.

AT the annual meeting of the Westminster (Md.) Gas Light Company the following officers were chosen: Directors, John K. Reifsnider, Chas. B. Roberts, Edward Lynch, W. A. Cunningham, Robert C. Hall, Charles T. Reifsnider and Charles V. Wantz; President, John K. Reifsnider. The reports were satisfactory, in that they indicated a substantial increase in the Company's material prosperity. It is measurably certain that considerable will be done this season in the way of works enlargement, although the formal meeting of the Directors to positively outline the same will not be held for some weeks.

MR. J. J. H. BASSETT has been recalled to his former position of Superintendent of the Roanoke (Va.) gas works.

"C. H. D.," writing from Baltimore, Md., under date of the 21st inst., inclosed the following from the Baltimore *Sun*, dated the 18th inst.: "There is a strong organization in Chicago contending for municipal electric light. The Illinois Legislature is urged to enact a law to permit the city to construct and operate electric light machinery for lighting the streets and for other municipal purposes. In theory this proposed method of supplying light is generally considered the best. It would apply equally to other municipal matters, such as manufacturing gas as well as furnishing the water supply. In some cities the municipality has constructed and owns the street railways, and entire control of the streets is thus secured, whilst considerable revenues are derived from the lease of the privileges of transportation and low rates of fare are exacted. It is believed that as a rule the private corporations which supply cities with gas and electric lights and which own the street railways find their business very profitable. There is no reason why a municipal corporation should not be able to do these things as cheaply as private corporations, and save to the taxpayers the large profits which the private corporations generally exact. But, unfortunately, the experience of American cities which have from time to time embarked in these enterprises is not encouraging. The example furnished by the Philadelphia municipal gas works always confronts any movement toward municipal manufacturing. The gas works of that city became a political machine, used to control politics and enrich unscrupulous city bosses and ward politicians at the expense of the people. The methods of machine politics which prevail in almost every large American city prevent the success of any enlightened commercial enterprise of this kind, and the prudent citizens are apt to consider it safest and least expensive in the long run to pay the profits demanded by the private corporations, modified as much as possible by wholesome competition and wise restrictions. All municipal enterprises create more offices and more patronage, and this, in addition to other things, gives the machine boss a strong hold upon the city government. In view of all this, it might be well for Chicago to walk very circumspectly into this enterprise."

MR. J. O. MESSER, for some time in charge as Engineer of the municipal electric light plant at Alameda, Cal., resigned that berth to accept the position of Superintendent of the electric street railroad company. He assumes his new duties on April 1st.

THE Directors of the East Boston (Mass.) Gas Company have voted to reduce the selling rate to $1.60 per 1,00 cubic feet, the concession to take effect on April 1st. The present rate is $1.75 per 1,000.

THE people residing in Waterford, N. Y., which district is supplied with gas by the Troy Company, are complaining loudly over the rate charged for gas—$2 per 1,000 cubic feet. In fact, the dissatisfaction is so great that a movement is underway for the establishment of an electric lighting plant, to be operated by local capital.

WE chronicle with regret the death of Dr. Edward Rupert Humphreys, whose demise occurred on Monday, March 20th, at his home in Boston, No. 6 Westland avenue, Back Bay district. Mr. Humphreys,

who was widely known in the educational circles of Boston, will be more readily identified by the gas fraternity, when it is stated that Mr. C. J. R. Humphreys, Agent of the Lawrence (Mass.) Gas Company, and Mr. Alexander C. Humphreys, General Superintendent of the United Gas Improvement Company, are his sons. The following biographical sketch of deceased is from the New York *Herald*, of Wednesday last: "Dr. Edward Rupert Humphreys was born in England, March 1, 1820, and graduated from the University of Cambridge, where he studied medicine. He was made, in 1841, Director of Education of Prince Edward Island, which position he gave up to take the position of Head Master in Classics in Merchiston Castle Academy, near Edinburgh, in 1848. His learning secured his election as Fellow of the Educational Institute of Scotland, in 1849, and the following year won him the degree of LL.D., from King's University and King's College, in Aberdeen. For seven years he held the place of head master of ancient languages in the Grammar School of Cheltenham, and during his incumbency there he was made President of the College of Preceptors in London, which place he resigned with his other position to come to America about 30 years ago. During the war and afterward he contributed a series of articles to *Moore's Masonic Magazine*, on the alleviation of war's necessary sufferings. He also wrote an historical work on Masonry, and was a prominent member of that order. Among some of his other works are: 'Lessons on the Liturgy of the Protestant Episcopal Church,' 'Essays on the Education of Military Officers,' 'The Higher Education of Europe and America,' 'America's Past, Present and Prospective,' and a manual of political economy, of which a second edition was printed in 1885. A widow and several children survive him."

THE proprietors of the Denver (Col.) Consolidated Gas Company have declared a quarterly dividend of 1 per cent., ordering it made payable on April 1st.

THE following preamble and resolutions, presented by Alderman Smithers at a meeting of the Board of Aldermen of Buffalo, were adopted:

Whereas, The city of Cleveland has recently passed an ordinance fixing the price to be paid by consumers of illuminating gas of 18-candle power at 80 cents per 1,000 cubic feet, and also requiring the several gas companies of the city to pay into the city treasury 6½ per cent. of their gross earnings, said rates to remain so fixed for a term of 10 years, and,

Whereas, The city of Buffalo is nearly as well situated for the manufacture of as cheap gas as in Cleveland; therefore,

Resolved, That it is the sense of this Board that a good quality of illuminating gas should be furnished to consumers in Buffalo at a rate not exceeding $1 per 1,000 cubic feet, and if fixed for a term of years, such rates should be considerably less.

Resolved, That the Corporation Council be and he is hereby directed to report to this Board whether the Common Council of the city of Buffalo has the power to fix the price and prescribe the terms and conditions under which the several gas companies of the city shall furnish gas to private consumers.

A NOT particularly edifying discussion ensued on the reading of the Smithers' presentment. Mr. Smithers began his remarks by asserting that the preamble was based upon a communication received by him from the Mayor of Cleveland. He claimed that the bye-products from the manufacture of gas had so greatly increased in value of late years—so he had been informed, although perhaps it "was not strictly true"—that the receipts from sales of same were equal to paying the entire expense of operating the plant. He followed this up with "a few figures" submitted in proof that gas could not cost the Buffalo Companies over 37 cents "at the consumer's burner," and wound up his bellows, or his argument, in this fashion: "I honestly believe that a much better quality of gas than we now have in Buffalo could be sold at 80 cents per 1,000 and yield to the manufacturers nearly 10 per cent. over the cost of production and distribution." This beautiful braying was still echoing in the chamber when Ald. White interjected a counter irritant in the shape of a remark that Mr. Smithers was very fond of indulging in buncombe, which elicited from the latter an exclamation that the former owned gas stock—and Buffalo gas stock is a handy thing to have, by the way, in your "tin box." Returning to the charge, Ald. White admitted that if he wanted to take any stock in gas he would not go any further than the gentleman on his right (Smithers), who always had a good supply on hand—indeed, he questioned whether any "legitimate" gasholder in Buffalo had as much capacity for retaining and emitting gas as was the portion of Ald. Smithers. With this exchange of amenes, the resolutions were adopted.

THE rumors of 8 or 10 months back that an opposition Gas Company would be put in the field at Montreal, Canada, have been revived. It is asserted that certain capitalists have succeeded to the rights under the charter granted last year to the St. Henri Light and Power Company, and that work will be commenced at once. It is said that certain prominent men in the Canada Pacific Railway are interested in the movement.

MR. THOMAS HAWKEN, Superintendent of the Knox Gas and Electric Company, the concern that recently took over the gas and electric lighting interests of Rockland and Thomaston, says that the Company will be in readiness to supply current to general consumers on incandescent electric lighting account. The Company offers to do all the necessary wiring at cost of same.

THE works of the Menominee (Mich.) Gas Light and Fuel Company will be located on a plot in the northern part of the city, close to the tracks of the Northwestern and the M. & N. Railroads. The proprietors are all residents of Menominee, and it is promised that the works will be completed by July 1st. It is also noteworthy that this is a case of a gas works following the completion and operation of an electric lighting plant, an enterprise of the latter kind having been carried on at Menominee for some time.

WE are indebted to Mr. A. R. Teller, of Baltimore, Md., for the following: "The District Commissioners (Washington, D. C.), have promulgated a series of regulations to govern the practice of gasfitting, and applicable to every system of pipes used for the purpose of conveying and distributing illuminating gas in any building or premises except those owned or under the control of the United States. After May 1, 1893, every person who shall desire to practice the business of gasfitting shall, unless he has previously received a license as a master plumber, apply to the plumbing board for examination, and, if he shall be declared competent, he shall file in the office of the Commissioners a bond with two sureties in the sum of $1,000, conditioned upon the faithful performance, during the stated period of three years, of all gasfitting work in compliance with the regulation. The preliminary qualifications of a candidate for examination and registration are that he must not be less than 21 years of age, a citizen of the United States, and certified as a man of intelligence, good habits and character in separate letters from at least two responsible citizens of the District. Following is the text of the most important sections: Any person who shall neglect or refuse to comply with the requirements of the provisions of these regulations, after ten days' notice of the specific thing required to be done thereunder, within the time limited by the Commissioners for doing such work, shall, upon conviction thereof, be punishable by a fine not more than $200 for each and every offense, or, in default of payment of fine, to imprisonment for not to exceed thirty days. The inspection of gas piping within any building, lot, premises or establishment, from the connection at the gas meter to the terminus of the system, is hereby directed to be made by the Inspector of Plumbing or his duly authorized assistant. Upon the completion of any system of gas piping in a building, and before the floors are laid or the pipes and fittings concealed, there shall be filed in the office of the Inspector of Plumbing, by the plumber doing the work, a detailed plan of the same, showing the location and size of each pipe, with a statement that the system is ready for inspection. Upon the filing of the plan the Inspector of Plumbing shall promptly cause the system to be inspected and tested with a pressure of not less than six inches upon a mercury gauge. If the test and inspection be satisfactory, a certificate of approval shall be issued by the Inspector of Plumbing. No meter shall be attached to any pipe or system of pipes previous to the issuance of such certificate."

THE *Gas World* notes that Herr A. Slaby has been pursuing his experiments on the heat processes in the gas motor. He says that in the Otto machine the following are his observations: (1) The explosion in the firing tube gives rise to an increase of pressure, which is sudden though of small amount. (2) Next comes a strong sudden sweep of flame into the cylinder, followed by a relatively slow propagation of flame until all the gas is kindled. (3) The speed of propagation depends upon the mean composition of the mixture, the speed of the piston (increasing therewith), and with the greater or less homogeneity of the mixture. (4) The combustion takes from 0.03 to 0.06 second at any part of the cylinder, and the temperature attained is the maximum mean temperature. (5) This never exceeds 1,600° C. (6) Even during the period of combustion the flame travels along the walls and loses to them between 8 and 13 per cent. of the total heat; but this loss would have been greater if the contact had taken place instantly or at all points. The bulk of the combustion process goes on in the kernel of the gaseous mixture, locally surrounded only by indifferent gas. Hence the importance of the method introduced by Otto in his machines. But Otto himself did not desire the combustion period to be continued into the period of expansion.

The Market for Gas Securities.

Consolidated advanced sharply during the week, although the actual transactions were slight. The opening price to day (Friday) was 127½ bid, or a gain for the week of 5¼ points. It is in our opinion decidedly a purchase for either speculation or investment account. The impression gains ground that the rate bill is almost pulseless. Equitable is steady at 192, and Mutual is in demand, but no stock is offering. Standard, especially the preferred, is sought for. The Company has declared a quarterly dividend of 1 per cent., payable April 1st.

The Brooklyn situation is about as before, although one disturbing factor is the offer of the Equity Company to supply gas at the rate of $1 per 1,000, on and after April 1. To us this seems to be in the nature of a bluff. In any event, the threatened cut has sent quotations down to a lower figure than those reported for some time. Chicago gas is strong at 88 to 89, and Bay State shows slight improvement.

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 457
Wm. Henry White, New York City ... 463
Fred. Bredel, New York City ... 459
H. C. Slaney, New York City ... 457
Frederic Egner & Co., St. Louis, Mo ... 462
Geo. R. Rowland, Brooklyn, N. Y ... 457
Jas. R. Smedberg, Chicago, Ills ... 457

CHEMISTS.

Durand Woodman, New York City ... 448

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills ... 454
Bartlett, Hayward & Co., Baltimore, Md ... 461
United Gas Improvement Co., Phila, Pa ... 453
Burdett Loomis, Hartford, Conn ... 465
National Gas and Water Co., Chicago, Ills ... 455

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 463
Continental Iron Works, Brooklyn, N. Y ... 448
Deily & Fowler, Phila., Pa ... 463
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 460
Stacey Mfg. Co., Cincinnati, Ohio ... 463
Bartlett, Hayward & Co., Baltimore, Md ... 461
Davis & Farnum Mfg. Co., Waltham, Mass ... 460
R. D. Wood & Co., Phila., Pa ... 462
Bouton Foundry Co., Chicago, Ills ... 463
Isbell-Porter Company, New York City ... 462
Fred. Bredel, New York City ... 459
United Gas Improvement Co., Phila., Pa ... 453
National Gas Light and Fuel Co., Chicago, Ills ... 454
Berlin Iron Bridge Company East Berlin, Conn ... 450
National Gas and Water Co., Chicago, Ills ... 455
The Gas Works Construction Co., New York City ... 447
Frederic Egner & Co., St. Louis, Mo ... 462

GAS AND WATER PIPES.

Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 465
Ohio Pipe Co., Columbus, Ohio ... 465
M. J. Drummond, New York City ... 465
R. D. Wood & Co., Phila., Pa ... 462
Warren Foundry & Machine Co., New York City ... 465
Donaldson Iron Co., Emaus, Pa ... 465
Addyston Pipe and Steel Co., Cincinnati, O ... 465

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City ... 459

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 457
Perkins & Co., New York City ... 456
Despard Coal Coal, Baltimore, Md ... 457
Chesapeake and Ohio R. R. Coal Agency, N. Y. City ... 457
Westmoreland Coal Company, Phila., Pa ... 457
J. & W. Wood, New York City ... 456
Henry C. Scheel, New York City ... 457

CANNEL COALS.

Perkins & Co., New York City ... 461
J. & W. Wood, New York City ... 456
Wm. Hopper, Resident Director, Louisville, Ky ... 461

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 457

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 456

INCLINED RETORTS.

Parker-Russell M'ning and Mfg. Co., St. Louis, Mo ... 458

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 458
B. Kreischer & Sons, New York City ... 458
Adam Weber, New York City ... 458
Laclede Fire Brick Mfg. Co., St. Louis, Mo ... 458
Borgner & O'Brien, Phila., Pa ... 458
James Gardner, Jr., Pittsburgh, Pa ... 468
Henry Maurer & Son, New York City ... 458
Baltimore Retort and Fire Brick Co., Baltimore, Md ... 458
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 458
Brooklyn Fire Brick Works, Brooklyn, N. Y ... 458

GASHOLDER TANKS.

W. O. Whyte, New York City ... 454
J. P. Whittier, Brooklyn, N. Y ... 452

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass ... 467

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y ... 458

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City ... 447
R. D. Wood & Co., Phila., Pa ... 462
James R. Floyd & Sons, New York City ... 464
Continental Iron Works, Brooklyn, N. Y ... 448

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 461
Fred. Bredel, New York City ... 459
J. H. Gautier & Co., Jersey City, N. J ... 459
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 458

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City ... 455
Wilbraham Baker Blower Co., Phila., Pa ... 455

GAS GAUGES.

The Bristols' Mf'g. Co., Waterbury, Conn ... 447

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page's Sons, N. Y. City ... 452

AMMONIA CONCENTRATOR.

Michigan Ammonia Works, Detroit, Mich ... 447

GAS METERS.

John J. Griffin & Co., Phila., Pa ... 466
American Meter Co., New York and Philadelphia ... 467
The Goodwin Meter Co., Philadelphia, Pa ... 468
Helme & McIlhenny, Phila., Pa ... 467
D. McDonald & Co., Albany, N. Y ... 467
Nathaniel Tufts, Boston, Mass ... 466
Maryland Meter and Manufacturing Co., Baltimore, Md ... 466
Harris Bros. & Co., Philadelphia, Pa ... 466
Keystone Meter Co., Royersford, Pa ... 467
Metric Metal Co., Erie, Pa ... 465

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City ... 462
Continental Iron Works, Brooklyn, N. Y ... 448

INCANDESCENT GAS LAMPS.

Welsbach Light Co., Gloucester City, N. J ... 450

BURNERS.

C. A. Gefrorer, Phila., Pa ... 446
Moses G. Wilder, Phila., Pa ... 447

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 459
Bartlett Street Lamp Mfg. Co., New York City ... 459

PURIFYING MATERIAL.

Connelly Iron Sponge and Governor Co., New York City ... 455
Greenpoint Chemical Works, Brooklyn, N. Y ... 455
Henry W. Douglas, Ann Arbor, Mich ... 455

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City ... 463
Fort Wayne Electric Co., Fort Wayne, Ind ... 267

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind ... 452
Isbell-Porter Company, New York City ... 462
Wilbraham Baker Blower Co., Philadelphia, Pa ... 455
Connelly Iron Sponge and Governor Co., New York City ... 455

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 447
Chapman Valve Manufacturing Co., Boston, Mass ... 447
R. D. Wood & Co., Phila., Pa ... 462
The P. H. & F. M. Roots Co., Connersville, Ind ... 416
Continental Iron Works, Brooklyn, N. Y ... 448

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 462

ENGINES AND BOILERS.

The Hazelton Boiler Co., New York City ... 449

PURIFIER SCREENS.

John Cabot, New York City ... 447

GAS STOVES.

American Meter Co., New York and Philadelphia ... 451
The Goodwin Meter Co., Phila., Pa ... 468
George M. Clark & Co., Chicago, Ills ... 449
Maryland Meter and Manufacturing Co., Baltimore, Md ... 466
The Schneider & Trenkamp Co., Cleveland, O ... 448

DIVIDEND NOTICE.

STANDARD GAS LIGHT CO. OF THE CITY OF NEW YORK,
71 BROADWAY, NEW YORK, Mar. 17, 1893.

The Board of Directors have this day declared a dividend of one (1) per cent. on the Preferred Stock of this Company, payable on April 1, 1893, to stockholders of record at 3 o'clock P.M., Mar. 24, 1893.

Transfer books will be closed from 3 o'clock P.M., Mar. 24, 1893, to 10 o'clock A.M., April 3, 1893.

FERDINAND McKEIGE,
929-2 Secretary.

POSITION WANTED.

Young man, with 9 years' experience in the gas business, is desirous of obtaining a position where the responsibility and opportunities for advancement will be greater. Understands thoroughly the manufacture and distribution of gas, and all work pertaining to the street and jobbing departments. Best of references. Address "G.," care this Journal.
929-2

Position Desired

AS SUPERINTENDENT OF THE FITTING AND COMPLAINT DEPARTMENT.

A young man who thoroughly understands all the details of the Distribution Dept., mains, fittings, meter setting and gas stoves, desires to better himself. Is now in the employ of a large Company. A1 references as to capability. Address
929-2 "METER," care this Journal.

WANTED,

Four Second-Hand Purifiers,
with Dry Center Valves. Also,
One Roots Exhauster.
Please state size, age, and condition. Address
929-3 "M. G. F.," care this Journal.

FOR SALE,

Two Ten-Inch Dry Center Seals,
in good condition, and one
Small Multitubular Condenser,
4 ft. diameter and 14 ft. high.
For particulars inquire of FRED. BREDEL, C.E.,
929-tf 118 Farwell Ave., Milwaukee, Wis.

For Sale.

Two 10 x 10 x 3 Ft. Purifiers,
with Covers, Trays, Bars, etc., complete. Also,
Ten-Inch Center Seal,
in best condition.
929-2 Address "E. R. G.," care this Journal.

FOR SALE,

Two Westinghouse Engines, of 12 H.P. each.
Ten 12-inch Chapman Valves.
All in good order. Address NEW HAVEN GAS LT. CO.,
922-tf New Haven, Conn.

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.